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MARSAME Release Report for TA-21 Buildings 227 (superstructure), 229, and 387 (November 2015)

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Summary

ENV-ES finds that the materials associated with TA-21 Buildings 227 (superstructure only), and 229 (see Figure 1) meet the criteria for unrestricted release to the public for recycle or as sanitary/commercial waste. The interior and exterior of the metal shed, building 387, passed the release criteria collectively; however, results from the roof of the structure were above reference background measurements. Waste management should be consulted for waste disposition options for the roofing metal. These findings are consistent with the requirements of DOE Order 458.1 "Radiation Protection of the Public and the Environment" and LANL Policy 412 "Environmental Radiation Protection." Sampling and data analysis, as described in this report, were sufficient to meet measurement objectives under the Multi-Agency Radiation Survey and Assessment of Materials and Equipment (MARSAME) manual (2009).

Introduction

The TA-21 sewage treatment Facility (STF) processed sewage for buildings in TA-21. The STF is no longer needed and is scheduled for demolition. Initial characterization surveys for Buildings 227, 229, 387, and associated sumps were completed in May 2015 and the final MARSAME release survey was completed in October 2015. Based on the results from the characterization and the release survey, ENV-ES found that the superstructure could be segregated from below grade structure for evaluation to be disposed as either uncontaminated industrial waste or recycle (concrete and metal). Given the higher potential for contamination, a more thorough survey of the below grade structure, water, and sediment would be required using MARSAME protocol prior to any releases to industrial landfills or for recycle. For all materials, waste management requirements need to be met.



Figure 1 Aerial view of TA 21 Buildings 227, 229, and 387.

MARSAME Survey Description

Data quality objectives for transfer of items into the public domain are described in ENV-ES-TTP-001, R0 (2015). These buildings had inadequate process knowledge available to confirm a decision of “non-impacted” under MARSAME guidance. However, due to expected near-background levels of radiological contamination, this buildings were classified as Class 3. Using this approach, the buildings were separated into statistical decision units. Characterization surveys were conducted in May 2015, and the data quality and survey completeness were compared to MARSAME requirements. A final release survey plan was developed and approved by DOE in October 2015 (Attachment 1). Additional measurement were made in building 227, and all results are provided in this report (Attachment 2).

To ensure adequacy of survey coverage, ENV-ES uses the statistical software Visual Sample Plan (VSP) (Version 7, 2015). This software incorporates MARSAME requirements to generate a map of planned sampling locations to provide sufficient and representative data for a decision based on the estimated standard deviation of radiological measurements in the survey unit. Fundamental assumptions for this survey plan included the following:

- The data was not assumed to be normally distributed
- The null hypothesis (H_0) in the IFB case is that the radionuclide concentration in the survey unit is IFB. A Type I error (incorrectly rejecting the null hypothesis) means “failing” the survey unit or calling the material contaminated when in fact the material is IFB. Type I error was set at 5%.
- The alternative hypothesis (H_a) in the IFB case is that the radionuclide concentration in the survey unit is elevated above (distinguishable from) background. A Type II error (incorrectly failing to reject the null hypothesis) means “passing” the survey unit or calling the material IFB when in fact it contains elevated radionuclide concentration above background. Type II error was set at 10%.

Survey Quality Objectives

The number and placement of sampling locations in the characterization survey was compared to MARSAME requirements for final release. The statistical inputs used for this assessment and the sampling plans are presented in Appendix 1. In all cases, the combination of characterization and final release sampling provided an adequate number of data points and spatial distribution to make a statistically-based release decision.

Measurement Quality Objectives

The items included in this report were classified as Class 3 (minimal potential for contamination) consistent with MARSAME. Sampling and analysis protocol for these items was consistent with LANL policy and procedures (LANL P412, TPP 001, RP-1-DP-043). Direct measurements were made using a SHP380AB probe coupled with an Eberline E600 instrument. NUCON smears were used to collect removable samples and were counted using a Berthold 2010/143. This assessment confirms that the measurement quality objectives were met for the disposition of the materials.

Potential disposition pathways for this project included:

- 1) Release of metal for recycle using a release criterion of indistinguishable from background.
- 2) Release of concrete for recycle using a release criterion of < Table 10.2 level in P412.
- 3) Release of construction and demolition debris (all other material) for disposal at commercial/municipal landfills using a release criterion of indistinguishable from background.
- 4) Low Level Waste disposal for any material that is not indistinguishable from background.

The objectives of the measurements were to confirm, within the stated statistical confidence limits, that:

- 1) Measurements of total and removable surface radioactivity are below Table 10-2 values in LANL Policy 412 (P412), which are preapproved authorized limits for release for recycle; and
- 2) Potential residual radioactive contamination is below background levels (i.e. sample distribution is statistically indistinguishable from background distribution).

All data met the Measurement Quality Objectives (MQO). Specifically:

- 1) Appropriate instrumentation and techniques were used for the measurements and the expected radionuclides;
- 2) Scanning surveys (10% coverage for MARSAME Class 3) were used to search for hot spots;
- 3) Instruments were calibrated, response checked and background measurements were within expected ranges; and
- 4) The minimum detectable concentrations of the measurements were calculated to be below the surface contamination values in Table 10-2 of P412.

Data Analysis

Naturally occurring radioactive material in building materials is not removable, so the results for *removable* alpha and beta counts were compared to the instrument minimum detectable activity (MDA).

For *direct* alpha and beta counts, results were compared to expected background counts on the surfaces of similar, uncontaminated building materials (as tabulated in Whicker et al 2015-Attachment 3 this report). ProUCL Version 5.0 was used to calculate 95% Upper Confidence Limits (UCLs) for the mean of the sample data. In some cases, some of the results were higher than the background UCL decision level. In these cases, a statistical Wilcoxon Rank Sum test was used to compare the survey distribution with the background distribution (per MARSAME Section 6.6.2).

Results

Raw data for the surveys are provided in Attachments 1 and 2. Data summaries for buildings are provided in Tables 1-3. Each data value was compared with the appropriate release criteria. For example, recycled concrete was evaluated against Table 10-2 limits in P412. Metal for recycle and building debris slated for disposal at commercial landfills were evaluated against the Indistinguishable from Background (IFB) criteria.

Table 1. Results for Building 227 interior and exterior.

Building 227 interior

Interior Alpha

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	0.5	Mean	25
Standard Error	0.097837	Standard Error	2.990271
Median	0	Median	23
Standard Deviation	0.7	Standard Deviation	20
Sample Variance	0.497749	Sample Variance	384.4939
Minimum	0	Minimum	0
Maximum	2.7	Maximum	79
Count	52	Count	43
Confidence Level(95.0%)	0.196416	Confidence Level(95.0%)	6.034611
UCL Estimate	0.686801	UCL Estimate	31.52298

Interior Beta

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	1.3	Mean	72
Standard Error	0.245571	Standard Error	19.1947
Median	0.1	Median	0
Standard Deviation	1.8	Standard Deviation	126
Sample Variance	3.135879	Sample Variance	15842.76
Minimum	0	Minimum	0
Maximum	6.5	Maximum	483
Count	52	Count	43
Confidence Level(95.0%)	0.493005	Confidence Level(95.0%)	38.73646
UCL Estimate	1.794928	UCL Estimate	111.1086

Building 227 exterior

Exterior Alpha

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	0.7	Mean	39
Standard Error	0.184546	Standard Error	9.706374
Median	0	Median	27.5
Standard Deviation	0.9	Standard Deviation	48
Sample Variance	0.817373	Sample Variance	2261.129
Minimum	0	Minimum	0
Maximum	2.7	Maximum	164
Count	24	Count	24
Confidence Level(95.0%)	0.381762	Confidence Level(95.0%)	20.07916

Exterior Beta

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	0.8	Mean	96
Standard Error	0.306392	Standard Error	34.54343
Median	0	Median	0
Mode	0	Mode	0
Standard Deviation	1.5	Standard Deviation	169
Sample Variance	2.253025	Sample Variance	28637.97
Minimum	0	Minimum	0
Maximum	5.1	Maximum	531
Count	24	Count	24
Confidence Level(95.0%)	0.63382	Confidence Level(95.0%)	71.45854

Conclusions from data:

Building 227- interior:

- No removable contamination. All results were <MDA
- All direct measurements for metal and materials for landfill disposal were IFB
- All direct measurements on concrete were < Table 10.2 preauthorized limits

Building 227- exterior:

- No removable contamination. All results were <MDA
- All direct measurements for metal and materials for landfill disposal were IFB
- All direct measurements on concrete were < Table 10.2 preauthorized limits

Conclusion: Building materials from Building 227 are candidates for public release for the defined disposition pathway.

Table 2. Results for building 229 interior

Building 229 interior

Interior ALPHA			
<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	0.5	Mean	9
Standard Error	0.148337	Standard Error	1.957634
Median	0	Median	7
Standard Deviation	0.8	Standard Deviation	10
Sample Variance	0.594103	Sample Variance	103.4729
Minimum	0	Minimum	0
Maximum	2.6	Maximum	40
Count	27	Count	27
Confidence Level(95.0%)	0.304911	Confidence Level(95.0%)	4.023974
Interior Beta			
<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	1.0	Mean	90
Standard Error	0.333235	Standard Error	32.69693
Median	0	Median	0
Standard Deviation	1.7	Standard Deviation	170
Sample Variance	2.998234	Sample Variance	28865.41
Minimum	0	Minimum	0
Maximum	6.9	Maximum	538
Count	27	Count	27
Confidence Level(95.0%)	0.684975	Confidence Level(95.0%)	67.2095

Building 229 exterior**Exterior Alpha**

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	0.9	Mean	74.4
Standard Error	0.216392	Standard Error	10.44523
Median	1.1	Median	73
Mode	0	Mode	73
Standard Deviation	0.8	Standard Deviation	40.5
Sample Variance	0.702381	Sample Variance	1636.543
Minimum	0	Minimum	18
Maximum	2.7	Maximum	154
Count	15	Count	15
Confidence Level(95.0%)	0.464114	Confidence Level(95.0%)	22.40279

Exterior Beta

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	1.5	Mean	4.1
Standard Error	0.659326	Standard Error	4.133333
Median	0.1	Median	0
Mode	0	Mode	0
Standard Deviation	2.6	Standard Deviation	16.0
Sample Variance	6.520667	Sample Variance	256.2667
Minimum	0	Minimum	0
Maximum	8.4	Maximum	62
Count	15	Count	15
Confidence Level(95.0%)	1.414114	Confidence Level(95.0%)	8.865118

Conclusions from data:**Building 229: interior:**

- No removable contamination. All results were <MDA
- All direct measurements for metal and materials for landfill disposal were IFB
- All direct measurements on concrete were < Table 10.2 preauthorized limits

Building 229: exterior:

- No removable contamination. All results were <MDA
- All direct measurements for metal and materials for landfill disposal were IFB
- All direct measurements on concrete were < Table 10.2 preauthorized limits

Conclusion: Building materials from Building 229 are candidates for public release for the defined disposition pathway.

Table 3. Results from building 387 interior.
Building 387 interior

Interior alpha

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	0.5	Mean	8
Standard Error	0.174547	Standard Error	2.666122
Median	0	Median	3
Mode	0	Mode	0
Standard Deviation	0.7	Standard Deviation	11
Sample Variance	0.548399	Sample Variance	127.9477
Minimum	0	Minimum	0
Maximum	2.5	Maximum	42
Count	18	Count	18
Confidence Level(95.0%)	0.368262	Confidence Level(95.0%)	5.625026

Interior Beta

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	1.3	Mean	26
Standard Error	0.471144	Standard Error	15.06684
Median	0.25	Median	0
Mode	0	Mode	0
Standard Deviation	2.0	Standard Deviation	64
Sample Variance	3.995588	Sample Variance	4086.173
Minimum	0	Minimum	0
Maximum	7	Maximum	232
Count	18	Count	18
Confidence Level(95.0%)	0.994028	Confidence Level(95.0%)	31.78825

Building 387 Exterior

Exterior Alpha

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	1.1	Mean	135
Standard Error	0.357071	Standard Error	38.26004
Median	0.5	Median	33.5
Mode	0	Mode	14
Standard Deviation	1.4	Standard Deviation	153
Sample Variance	2.04	Sample Variance	23421.3
Minimum	0	Minimum	3
Maximum	4.1	Maximum	383
Count	16	Count	16

Confidence Level(95.0%)	0.76108	Confidence Level(95.0%)	81.54935
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Exterior Beta

<i>Removable (dpm/100cm²)</i>		<i>Direct (dpm/100cm²)</i>	
Mean	1.9	Mean	99.3
Standard Error	0.740552	Standard Error	34.71212
Median	0.6	Median	0
Mode	0	Mode	0
Standard Deviation	3.0	Standard Deviation	138.8
Sample Variance	8.774667	Sample Variance	19278.9
Minimum	0	Minimum	0
Maximum	10.8	Maximum	378
Count	16	Count	16
Confidence Level(95.0%)	1.578448	Confidence Level(95.0%)	73.98712

Conclusions from data:

Building 387- interior:

- No removable contamination. All results were <MDA
- All direct measurements for metal and materials for landfill disposal were IFB

Building 387- exterior:

- No removable contamination. All results were <MDA
- Direct measurements for metal and materials for landfill disposal were IFB for walls
- Direct measurements for the metal roof were > IFB. A Wilcoxon Rank Sum test of the data from the 16 measurements showed the combined measurements were IFB (rusted and non-rusted metal used in this analysis). However, the data show the roof measurements were significantly above the reference measurements for rusted metal.

Conclusion: Building materials from Building 387 are candidates for public release for the defined release pathway EXCEPT the exterior roof, which should be evaluated by Waste Management for waste disposition.

Conclusions

ENV-ES has evaluated the available process knowledge, as well as the survey results provided in Attachments 1 and 2, and found that surveys were adequate to support a conclusion of indistinguishable from background for all building materials from Buildings 227 (superstructure), 229 and 387. However, the roof of building 387 requires special attention since the values are statistically above background. The program should consult with LANL Waste Management prior to disposition of the roof material.

References

Los Alamos National Laboratory (2014). Eberline E-600 with Various Detectors. LANL Procedure RP-1-DP-043.02.

Los Alamos National Laboratory (2014). Environmental Radiation Protection. LANL Policy 412, R1.

Los Alamos National Laboratory (2015). Data Quality Objectives for Measurement of Radioactivity in or on Items for Transfer into the Public Domain. LANL Technical Project Plan ENV-ES-TPP-001, R0.

Rev. 10/9/2015

MARSAME (Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual), (2009). NUREG-1575 (Supp. 1), EPA 402-R-09-001, DOE/HS-004.

VSP Development Team (2015). Visual Sample Plan: A tool for design and analysis of environmental sampling. Version 7.4. Pacific Northwest National Laboratory. Richland, WA. <http://vsp.pnnl.gov>

Whicker, J.J., Gillis, J., McNaughton, M., Ruedig, E. Measurements of alpha and beta radiation from uncontaminated surfaces of common building materials. Los Alamos National Laboratory report LA-UR-28370; 2015.

Attachments and Appendices

Attachment 1: *Final Status Survey Plan for Buildings 227 (superstructure), 229 and 387*

Attachment 2: *Results of surveys for Buildings 227 (superstructure), 229 and 387*

Attachment 3: *Summary statistics for background measurements of building materials*

Attachment 1
FY15 D&D Package, TA-21 Sewage Treatment Facility
Buildings 227, 229, and 387
TA-21 D&D MARSAME Final Status Sampling Plan
Structures: 21-0227, 21-0229, & 21-0387
Rev. 0, Dated 10/20/2015

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Summary

The TA-21 sewage treatment Facility (STF) processed sewage for buildings in TA-21. The STF is no longer needed and is scheduled for demolition. Initial characterization surveys for Buildings 227, 229, 387, and associated sumps were completed in May 2015. Based on the results from the characterization survey, and pending a MARSAME release survey, ENV-ES found that the superstructure could be segregated from below grade structure for evaluation to be disposed as either uncontaminated industrial waste or recycle (concrete and metal). The scope of this sampling and analysis plan includes only the superstructure. Given the higher potential for contamination, a more thorough survey of the below grade structure, water, and sediment would be required using MARSAME protocol prior to any releases to industrial landfills or for recycle. For all materials, waste management requirements need to be met.

A characterization survey of the building was completed and the results used to develop this final MARSAME release survey. In some cases, the characterization survey was sufficient to meet MARSAME requirements and no further surveys are required. There are several areas where additional surveys are required to fully meet the objectives of MARSAME, and sampling plans for these areas are outlined in this document.



1. **Purpose and Scope of the TA-18 D&D MARSAME Final Status Survey**

- 1.1. There are three TA-21 structures (21-0227, 229 and 387) that needed to be characterized to support Decontamination & Demolition (D&D) of these structures. All structures within this plan are considered potentially radiologically impacted based on historical knowledge of operations at TA-21. Since the structures are still standing, the MARSSIM survey approach was utilized to perform characterization surveys of these structures. However, since these structures will eventually be demolished and the waste and any recyclable materials will be sent offsite for disposal, the MARSAME data analysis approach will be utilized to evaluate the waste debris and recyclable material for disposal path decisions, as appropriate and as outlined in technical project plan ENV-ES-TPP-001, "Data Quality Objectives for Measurements of Radioactivity in or on Items for Transfer into the Public Domain."
- 1.2. The full procedure for personal property release
- 1.3. Per MARSSIM Section 2.4, there are six principal steps in the MARSSIM Radiation Survey and Site Investigation Process:
 - Site Identification
 - Historical Site Assessment (HSA)
 - Scoping Survey
 - Characterization Survey
 - Remedial Action Support Survey
 - Final Status Survey
- 1.4. The MARSSIM HSA information for these structures is contained in Section 2 below. Given the location and function of the STF, we determined these buildings have the potential to contain radiological contamination, and therefore scoping/characterization surveys were completed.
- 1.5. Once the characterization survey was completed, the characterization data was analyzed against the MARSAME guidance. Based on the characterization results, no remedial actions were identified, and these results were used to plan for the final status surveys.
- 1.6. Notes and Assumptions:
 - 1.6.1. This Final Status Survey plan was prepared in accordance with P412, Environmental Radiation Protection, and developed using P412 Data Quality Objectives.
 - 1.6.2. The results of this survey are to be used for D&D planning purposes. Per MARSSIM Section 2.4.6, "data from other surveys conducted during the Radiation Survey and Site Investigation Process – such as scoping, characterization, and remedial action support surveys – can provide valuable information for planning a final status survey provided they are of sufficient

quality.” Release of building materials is contingent upon clean surfaces passing a final status survey, as appropriate.

1.6.3. The nominal release criteria for this D&D project are from Table 10-2 of P412 for surface contamination (see Section 4 of this plan). Further restrictions may be imposed by the Waste Management Coordinator.

1.6.4. Waste disposition pathways for material from D&D projects are as follows:

- 1.6.4.1. Contaminated material that is known or suspected to exceed regulatory limits is to be disposed of as Low Level Waste (LLW).
- 1.6.4.2. Radiologically encumbered metal items (items within areas posted as radiological areas) fall under the metals moratorium and may not be released.
- 1.6.4.3. Unencumbered metals may be released for **reuse** within the DOE complex using the Table 10-2 criteria pending an ALARA evaluation.
- 1.6.4.4. Unencumbered metals may be released to the public for **recycle** or **disposal** using indistinguishable from background criteria.
- 1.6.4.5. Clean concrete may be released for recycle using the Table 10-2 criteria pending an ALARA evaluation.
- 1.6.4.6. Other D&D debris may be released to landfill under NMED regulations using indistinguishable from background criteria.

2. **Historical Site Assessment Information**

- 2.1. The STF never had radiological operations or was ever posted for radiological purposes. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STF, and the these buildings are in the TA-21 air shed, the buildings associated with the STF (blds. 227, 229, and 387) are considered to be Class 3 materials, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).
- 2.2. Attachment 1 provides the results of the characterization survey. Assessment of the surface contamination data in the characterization survey done for the upper superstructure at the sewage treatment plant (blds. 227, 229 and 387) showed no removable contamination and the direct surveys (alpha and beta) are consistent with background measurements of similar uncontaminated building materials. There was no detectable tritium in the smear surveys. These survey results combined with process knowledge confirm these structures as Class 3 under MARSAME guidance.

3. **Survey Units and Data Analysis**

- 3.1. This Final Status Survey is designed to provide sufficient information for D&D execution and disposition decisions. If surveyors encounter contamination or unexplained increases in standard deviation or measured concentrations during D&D, further mitigation, sampling, and data analysis may be required.

- 3.2. Building and room maps are to be used as rough estimates of the spatial layout of the buildings. Adjustments to the survey units and/or maps may be required based on building specifics for this characterization survey and any additional surveys.

4. Nominal Release Criteria

- 4.1. Table 1 presents the nominal release criteria for surface contamination.

Table 1: Values from P412 Section 1021 Table 10-2		
U-natural, U-235, U-238 and associated decay products (Removable)	1,000	dpm/100cm ²
U-natural, U-235, U-238 and associated decay products (Total)	5,000	dpm/100cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 (Removable)	20	dpm/100cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 (Total)	100	dpm/100cm ²
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 (Removable)	200	dpm/100cm ²
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 (Total)	1,000	dpm/100cm ²
β/γ emitters (Removable)	1,000	dpm/100cm ²
β/γ emitters (Total)	5,000	dpm/100cm ²
Tritium and Special Tritium Compounds	10,000	dpm/100cm ²

- 4.2 Based on process knowledge of facility operations, sampling and data analysis for volumetric contamination is not required for the superstructure of the buildings. If evidence for volumetric contamination is encountered, volumetrically contaminated items may be released using a criterion of statistically indistinguishable from background, as compared to measured background radioactivity in clean materials.

5. General Survey Instructions

- 5.1 Verify characterization activities are on the applicable Plan-of-the-Day, as appropriate.
- 5.2 Perform a Pre-Evaluation Brief and/or Job Task Brief in accordance with P300.
- 5.3 Verify personnel have appropriate training for the applicable tasks they will be performing.
- 5.4 Comply with applicable Radiological Work Permit (RWP) requirements, if RWP is required.
- 5.5 Follow applicable IWD(s), as necessary.

6. Survey-Specific Instructions

- 6.1 A general overview of the final status is provided in Table 2, and detailed locations for survey are for each of the buildings are provide in Appendix 1.
- 6.2 Follow P121, RP-1-DP-37 “Surveying for Fixed and Removable Contamination”, and other applicable characterization and sampling procedures. Document all survey results on the appropriate survey form(s) and the survey map(s). All direct and removable measurement results are to be reported as dpm/100cm². Do not use “NDA.”
- 6.3 The number of direct and removable measurements are specified in the following Survey Unit and Survey Requirement tables for each survey unit. Survey point locations (both direct counts and smears) will be a combination of “Uniformly Distributed” and “Biased” locations determined by the Surveyors. Uniformly distributed points shall be spread across all survey unit surfaces in a uniform, even, systematic pattern (similar to a grid pattern). Survey point locations may be changed based on accessibility issues via consultation with Duane Parsons or Jeff Whicker.
- 6.4 Collect and record direct measurement instrument background readings periodically during surveys (approximately 5 background measurements per survey unit). Identify and document background measurements on the survey form and maps with the survey unit number, “-BKG,” and sequential background number (e.g. 1-BKG1, 1-BKG2, etc.). Collect background measurements on direct reading probes by pointing the probe into the air and away from any nearby surfaces.
- 6.5 Required Characterization Surveys include:
 - 6.5.1 Surface scan surveys using a SHP380AB (α / β) detector, listening for increased count rate areas.
 - 6.5.2 Surface scan surveys using a γ -specific detector, listening for increased count rate areas.
 - 6.5.3 60 second scalar direct surveys using an SHP380AB (α / β).
 - 6.5.4 Gamma spectral measurements on areas with increased count rates from the gamma scan survey.
 - 6.5.5 NUCON smears (counted for α and β/γ).
- 6.6 QA survey measurements are required for MARSAME Final Status Surveys. Duplicate measurements should be made at approximately 10 percent of the surveyed locations.
- 6.7 Scan percentages are specified in the following Survey Unit and Survey Requirement tables for each survey unit. For any areas of noticeably elevated count rate, a biased measurement (direct and smear) shall be collected and documented. When biased surveying is required, scan surveys should be used to decide locations of biased survey points, or the biased locations can be selected based on process knowledge. Denote

biased surveys sequentially after the last systematic survey location. Biased measurement locations may include: high traffic areas such as room entrances, HVAC intakes and exhaust ducts, storage areas, areas of frequent personnel contact such as doors and door frames, horizontal surfaces such as lab counter tops and shelves, sinks, the openings to sink and floor drains; the tops of lights, beams, crane rails, structural beams, etc.

- 6.8 On the survey forms, denote surface material (e.g., “concrete,” “metal,” etc.), as well as locations of biased surveys.
- 6.9 Use provided survey maps, or create scaled maps as necessary, to document the survey locations and results.
- 6.10 Smear survey results are to be reported in the form consistent with the results from HPAL. HPAL should be requested to report results as dpm/100cm² (not NDA). In consultation with HPAL, isotopic analysis can be performed on smears with high gross alpha/beta results if the radioisotope (or mixture) is unknown. Save all smears for possible future HPAL analysis.
- 6.11 Collect and maintain all characterization paperwork. Number each page of the survey unit packages using the format “XX of XX”. Survey Unit packages should include survey forms, maps, HPAL smear results, and HPAL isotopic analysis (if required). Provide all completed paperwork to Duane Parsons or Jeff Whicker.

7. Surface Labeling Requirements

- 7.1 Denote survey unit location numbers on structure surfaces where measurements are obtained. Mark locations on using the survey unit designation plus the next sequential survey point location number. For example, for survey unit 21-5-2, location survey point number 5, mark the structure surface with the number 21-5-2-5.
- 7.2 The direct reading probe outline shall be drawn on the surface with a marker and a template to identify the exact surveyed location in the event a re-survey is necessary.
- 7.3 Denote on the survey map where the scan, direct, and smear surveys were performed. Scan area may be approximated by a highlighted/circled area in survey units that require less than 100% scanning. Record the general scan findings on the survey forms and/or maps.

8.0 Special Support and Safety Requirements

- 8.1 Upper walls and ceilings/roofs require access via ladders, scaffolding, man-lifts, etc.
- 8.2 Survey technicians shall be trained for elevated work.
- 8.3 Pest control will likely be required in and around all structures.

Table 2. Summary of Final Status Survey for Superstructure of Buildings 227, 229, and 387 at the TA-21 Sewage Treatment Facility

Class 3 Areas These survey units have the potential to contain, or have ever contained, some residual radioactivity greater than natural or fallout background levels. Individual measurements may exceed background levels, but are not expected to exceed the action levels. A scan of between 10% and 100% of the available surface will be performed.							
Survey Area	Survey Unit	Description	Scan %	Direct Survey	Smears	Media	Class Justification
21-0227	Interior walls and ceiling	Interior of main sewage treatment building-superstructure only	10% (Complete)	~20 ~2 QA	~20 ~2 QA	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the walls and roof confirmed very low potential for contamination.</p>
21-0227	Interior floor	Interior of main sewage treatment building-Superstructure only	10% (Complete)	~15 ~2 QA (Complete)	15 ~2 QA (Complete)	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the interior walls and roof confirmed very low potential for contamination.</p>

21-0229	Interior floor, walls and ceiling	Interior of STF support building	10% (Complete)	~15 ~2 QA (Complete)	15 ~2 QA (Complete)	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the interior walls and roof confirmed very low potential for contamination.</p>
21-0227 (note: characterization survey was sufficient to meet MARSAME release survey- no additional surveys required)	Exterior walls and roof-superstructure only	Exterior of main sewage treatment building	10% (Complete)	~15 ~2 QA (Complete)	15 ~2 QA (Complete)	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the interior walls and roof confirmed very low potential for contamination.</p>

21-0229 (note: characterization survey was sufficient to meet MARSAME release survey- no additional surveys required)	Exterior walls and roof	Exterior of STF support building	10% (Complete)	~15 ~2 QA (Complete)	15 ~2 QA (Complete)	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the interior walls and roof confirmed very low potential for contamination.</p>
21-0387 (note: characterization survey was sufficient to meet MARSAME release survey- no additional surveys required)	Interior walls and roof	Interior of STF support building	10% (Complete)	~15 ~2 QA (Complete)	15 ~2 QA (Complete)	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the interior walls and roof confirmed very low potential for contamination.</p>

21-0387 (note: characterization survey was sufficient to meet MARSAME release survey- no additional surveys required)	Exterior walls and roof	Exterior of STF support building	10% (Complete)	~15 ~2 QA (Complete)	15 ~2 QA (Complete)	Surfaces	<p>Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STP is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).</p> <p>Characterization surveys from the interior walls and roof confirmed very low potential for contamination.</p>
Building Exterior Total			Complete	Complete	NA	0	
Interior Spaces Total			Complete	~50 ~6 QA	~50 ~6 QA	0	
Class 3 Total			Complete	~50 ~6 QA	~50 NUCON ~6 QA	0	

Appendix 1. Specific Sampling Locations for Final Status Survey

Building 227

227 Interior

Unit 1) Walls & Ceiling

- 19 additional measurements using systematic, triangular grid sampling

VSP measurement locations based on inputs from the building 227 interior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	0.5	0.7
Direct Alpha	52 Minimum DCGL for mixed surfaces – stucco	25	20
Removable Beta	11 MDA mean estimate	0.3	1.8
Direct Beta	700 Approximate DCGL for non-concrete surfaces	72	126
DCGL = Derived Concentration Guideline Level from MARSAME. This value is used as the limit to which measurements are compared. In this survey, DCGL values represent a threshold for Indistinguishable from Background decision making.			

Unit 2) Floor Components – COMPLETE – NO ADDITIONAL SAMPLING REQUIRED

Characterization survey coverage was adequate:

- Radiological conditions have not changed since characterization
- Adequate coverage of accessible surfaces and adequate number of samples (see VSP sample location placement)
- For direct alpha, 3 of 18 were greater than instrument MDA (all less than 89 dpm/100cm² for bare concrete)
- For direct beta, 2 of 18 were greater than instrument MDA (both less than 3489 dpm/100cm² for bare concrete)
- All other measurements were < instrument MDA
- Adequate scanning (10%)

Proposed VSP measurement locations based on inputs from the building 227 interior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	0.5	0.7
Direct Alpha	89 Background criterion for bare concrete	25	20
Removable Beta	11 MDA mean estimate	0.3	1.8
Direct Beta	700 Approximate DCGL for non-concrete surfaces	72	126

21-227 Exterior – COMPLETE – NO ADDITIONAL SAMPLING REQUIRED

Characterization survey coverage was adequate:

- Radiological conditions have not changed since characterization
- Semi-grid pattern over accessible surfaces
- Adequate number of samples (more than MARSSIM would assign for one decision area)
- For direct alpha, 5 of 24 were greater than instrument MDA (material varied but all less than 335 dpm/100cm² for rusted metal)
- For direct beta, 4 of 24 were greater than instrument MDA (concrete and roof asphalt shingles) highest was 531 dpm/100cm² which is less than concrete criterion 3489 dpm/100cm²
- All other measurements were < instrument MDA
- Adequate scanning (10%)

Proposed VSP measurement locations based on inputs from the building 227 exterior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	0.7	0.9
Direct Alpha	129 Background criterion for galvanized metal	39	48
Removable Beta	11 MDA mean estimate	0.8	1.5
Direct Beta	675 Approximate DCGL for rusted/painted metal surfaces	96	169

Building 229

21-229 Interior – COMPLETE – NO ADDITIONAL SAMPLING REQUIRED

Characterization survey coverage was adequate:

- Radiological conditions have not changed since characterization
- Adequate coverage of accessible surfaces and adequate number of samples (see VSP sample location placement)
- For direct beta, 4 of 27 were greater than instrument MDA (all less than 3489 dpm/100cm² for bare concrete)
- All other measurements were < instrument MDA
- Adequate scanning (10%)

Proposed VSP measurement locations based on inputs from the building 229 interior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	0.5	0.8
Direct Alpha	83 Background criterion for painted concrete	9	10
Removable Beta	11 MDA mean estimate	1.0	1.7
Direct Beta	675 Approximate DCGL for rusted/painted metal surfaces	90	170

21-229 Exterior – COMPLETE – NO ADDITIONAL SAMPLING REQUIRED

Characterization survey coverage was adequate:

- Radiological conditions have not changed since characterization
- Semi-grid pattern over accessible surfaces
- Adequate number of samples (see VSP sample location placement)
- For direct alpha measurements, 11 out of 15 measurements were greater than instrument MDA, two measurements greater than the background criterion of 129 dpm/100cm² for galvanized metal, and all less than the background criterion for rusted metal (335 dpm/100cm²)
- All other measurements were < instrument MDA
- Adequate scanning (10%)

Proposed VSP measurement locations based on inputs from the building 229 exterior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	0.9	0.8
Direct Alpha	129 Background criterion for galvanized metal	74	41
Removable Beta	11 MDA mean estimate	1.5	2.6
Direct Beta	150 Background criterion for galvanized metal	4	16

Building 387

21-387 Interior – COMPLETE – NO ADDITIONAL SAMPLING REQUIRED

Characterization survey coverage was adequate:

- Radiological conditions have not changed since characterization
- Semi-grid pattern over accessible surfaces
- Adequate number of samples (see VSP sample location placement)
- Adequate scanning (10%)
- All measurements were < instrument MDA

Proposed VSP measurement locations based on inputs from the building 387 interior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	0.5	0.7
Direct Alpha	52 Minimum DCGL for mixed surfaces – stucco	8	11
Removable Beta	11 MDA mean estimate	1.3	2.0
Direct Beta	150 Background criterion for galvanized metal	26	64

21-387 Exterior – COMPLETE – NO ADDITIONAL SAMPLING REQUIRED

Characterization survey coverage was mostly adequate:

- Radiological conditions have not changed since characterization
- Based on radiological history of exterior surfaces, we believe there is adequate coverage of accessible surfaces and number of samples (see VSP sample location placement)
- For direct alpha measurements, 6 out of 16 measurements (all on the roof) were greater than instrument MDA and 3 measurements exceeded the background criterion for rusted metal (335 dpm/100cm²)
 - Sign test applied per MARSSIM Section 8.3.2 or MARSAME Section 6.5.1: survey unit could pass with 5 of 16 values greater than the DCGL – Therefore, the measurements combined are indistinguishable from background and no additional sampling is required.
- For direct beta measurements, 3 out of 16 measurements (all on the roof) were greater than instrument MDA but none exceeded the background criterion for rusted metal (672 dpm/100cm²)
- All other measurements were < instrument MDA
- Adequate scanning (10%)

Proposed VSP measurement locations based on inputs from the building 387 exterior characterization survey:

Parameter	DCGL [dpm/100cm ²] Choice	Expected [dpm/100cm ²] from characterization	Standard Dev [dpm/100cm ²] from characterization
Removable Alpha	6 MDA mean estimate	1.1	1.4
Direct Alpha	335 Background criterion for rusted metal	135	153
Removable Beta	11 MDA mean estimate	1.9	3
Direct Beta	672 Background criterion for rusted metal	99	139

Maps of VSP-selected Sampling Locations

Note: Additional Final Status Survey sampling is **ONLY** required in building 227 interior

TA-21 Building 227

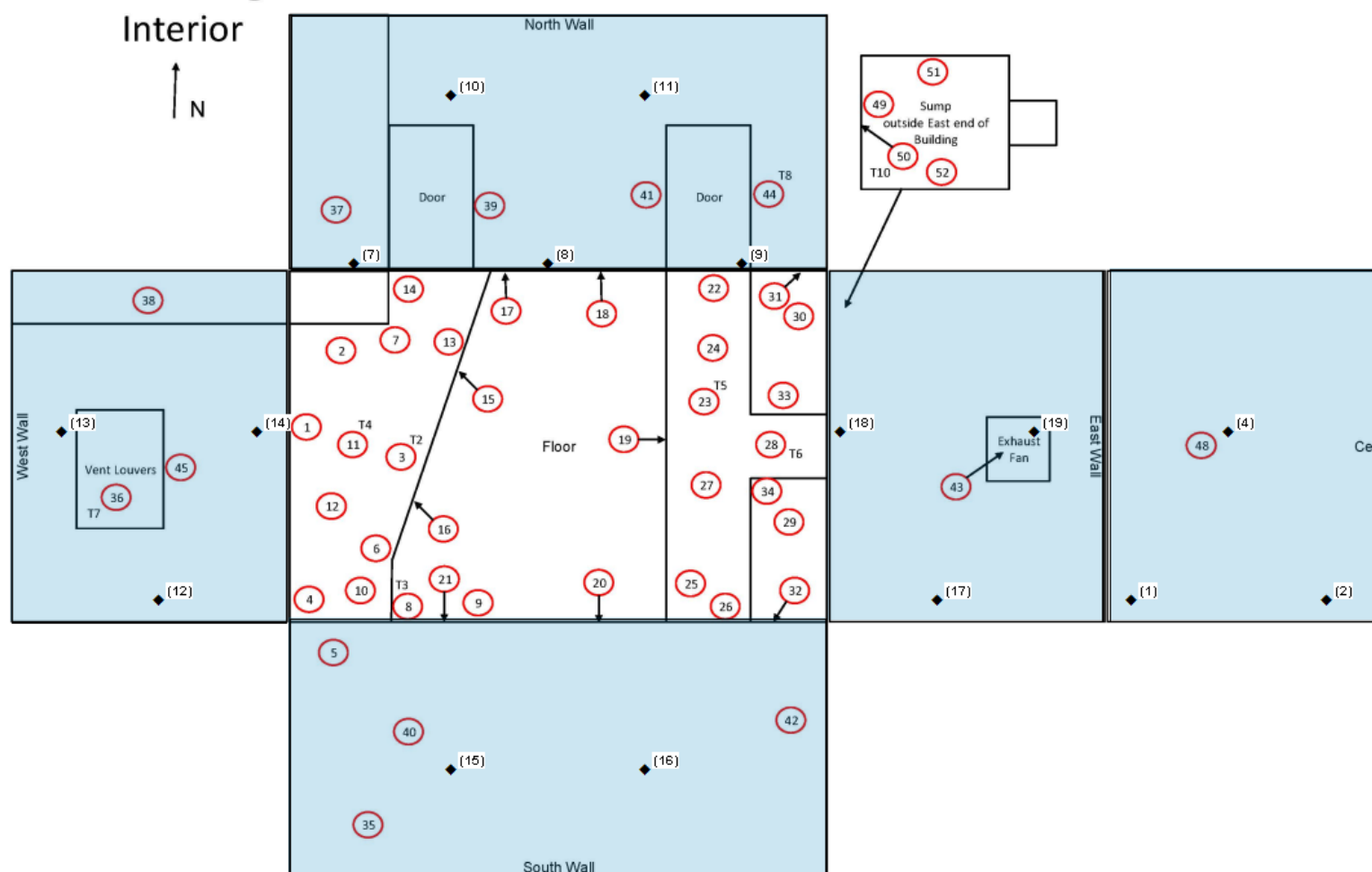


Figure 1. Final status survey locations are indicated with diamonds. Circled numbers represent sample locations from the characterization survey.

TA-21 Building 227

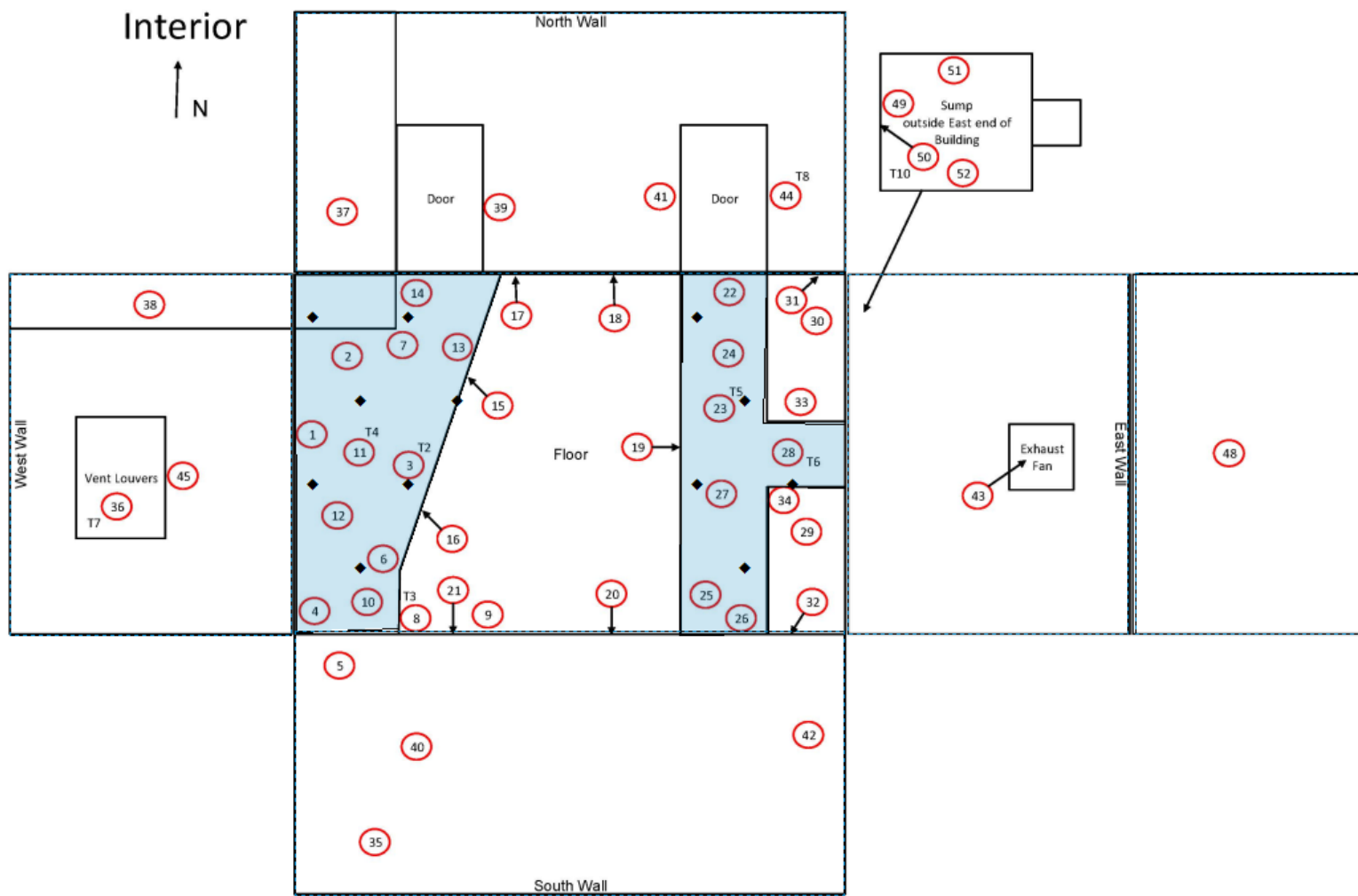


Figure 2. No additional sampling required in the shaded areas. VSP suggested sampling locations (black diamonds) are well-represented by the existing sampling locations (circled numbers).

TA-21 Building 227 Exterior

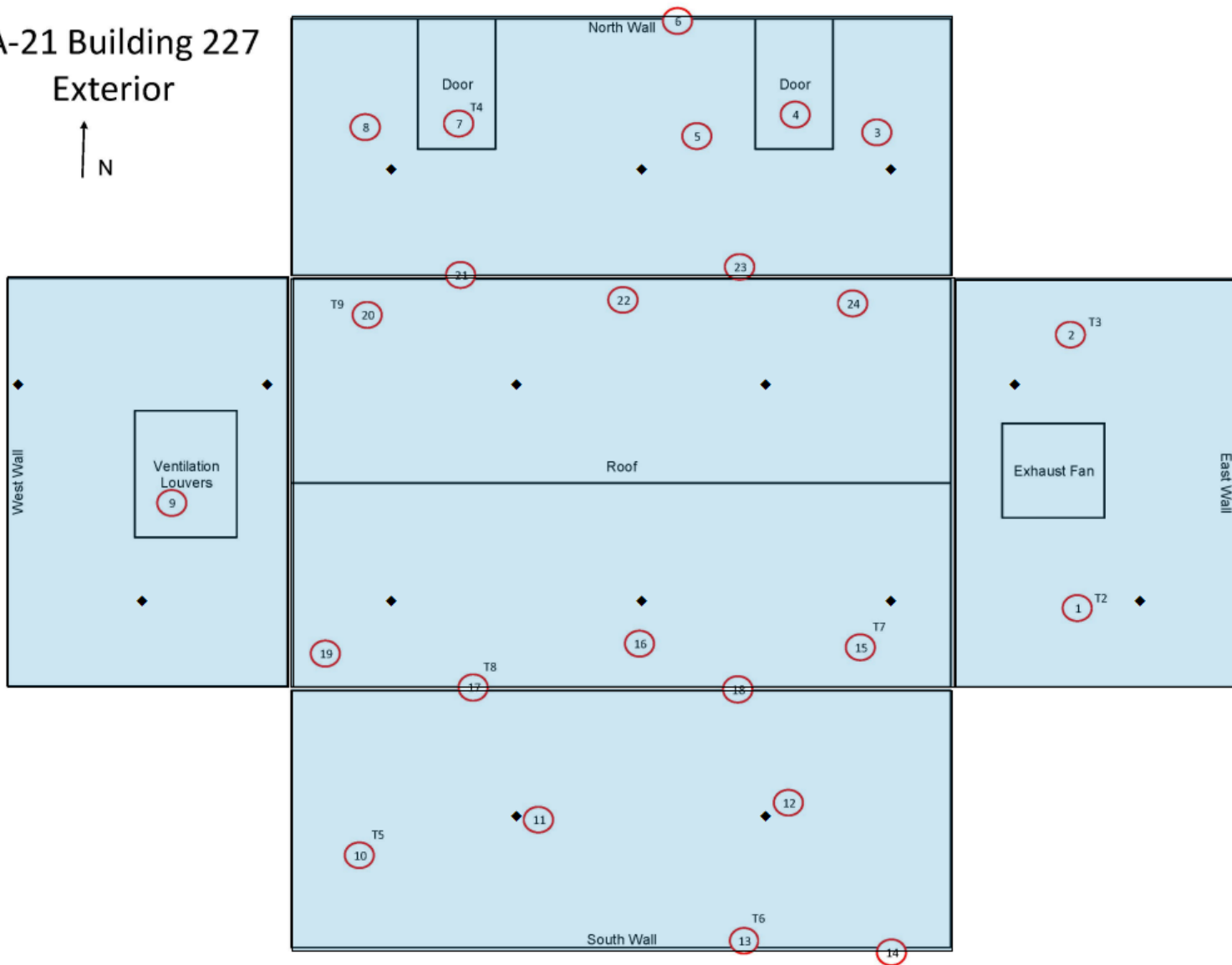


Figure 3. No additional sampling required in the shaded areas. VSP suggested sampling locations (black diamonds) are well-represented by the existing sampling locations (circled numbers).

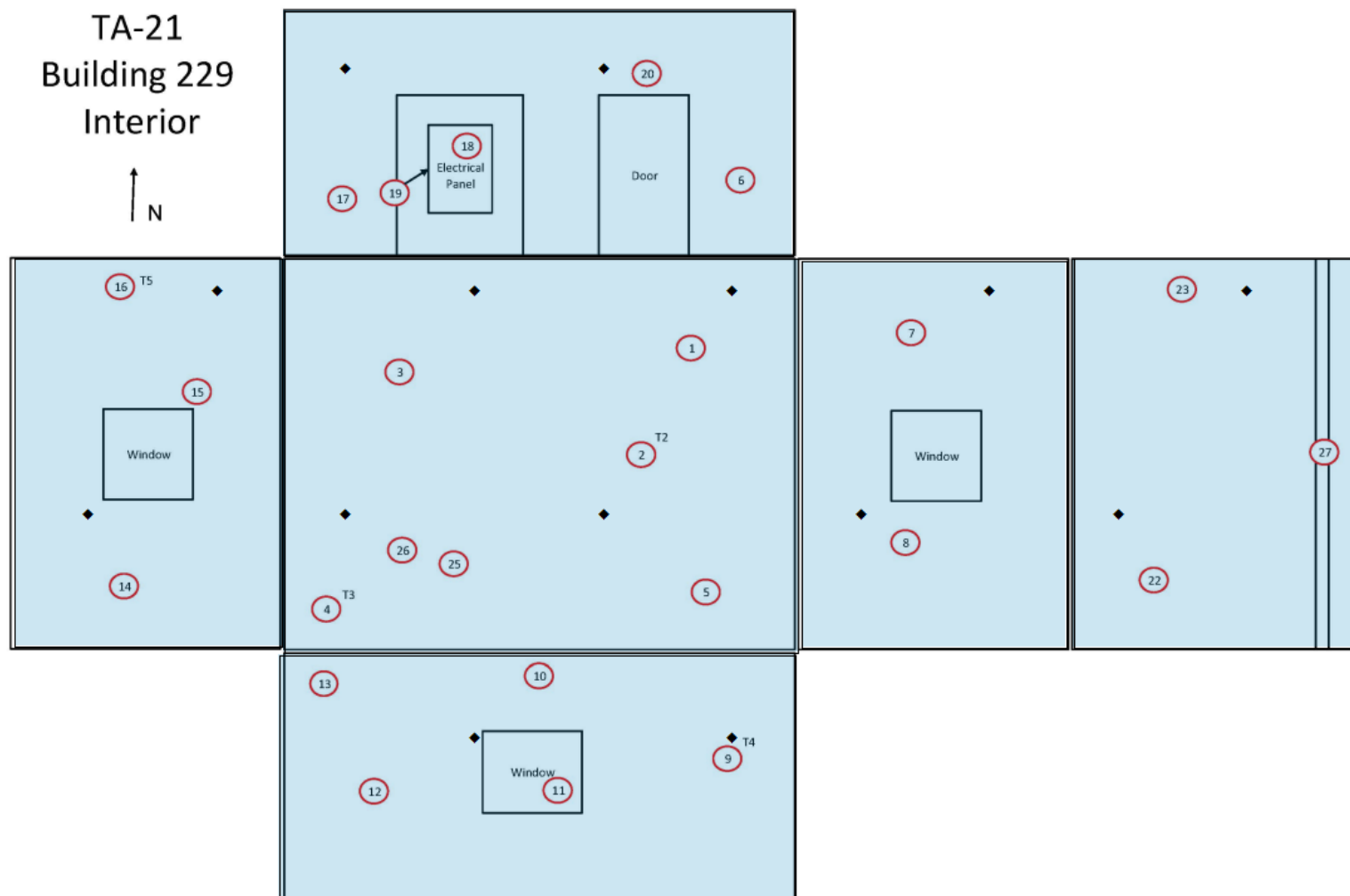


Figure 4. No additional sampling required in the shaded areas. VSP suggested sampling locations (black diamonds) are well-represented by the existing sampling locations (circled numbers).

TA-21 Building 229

Exterior

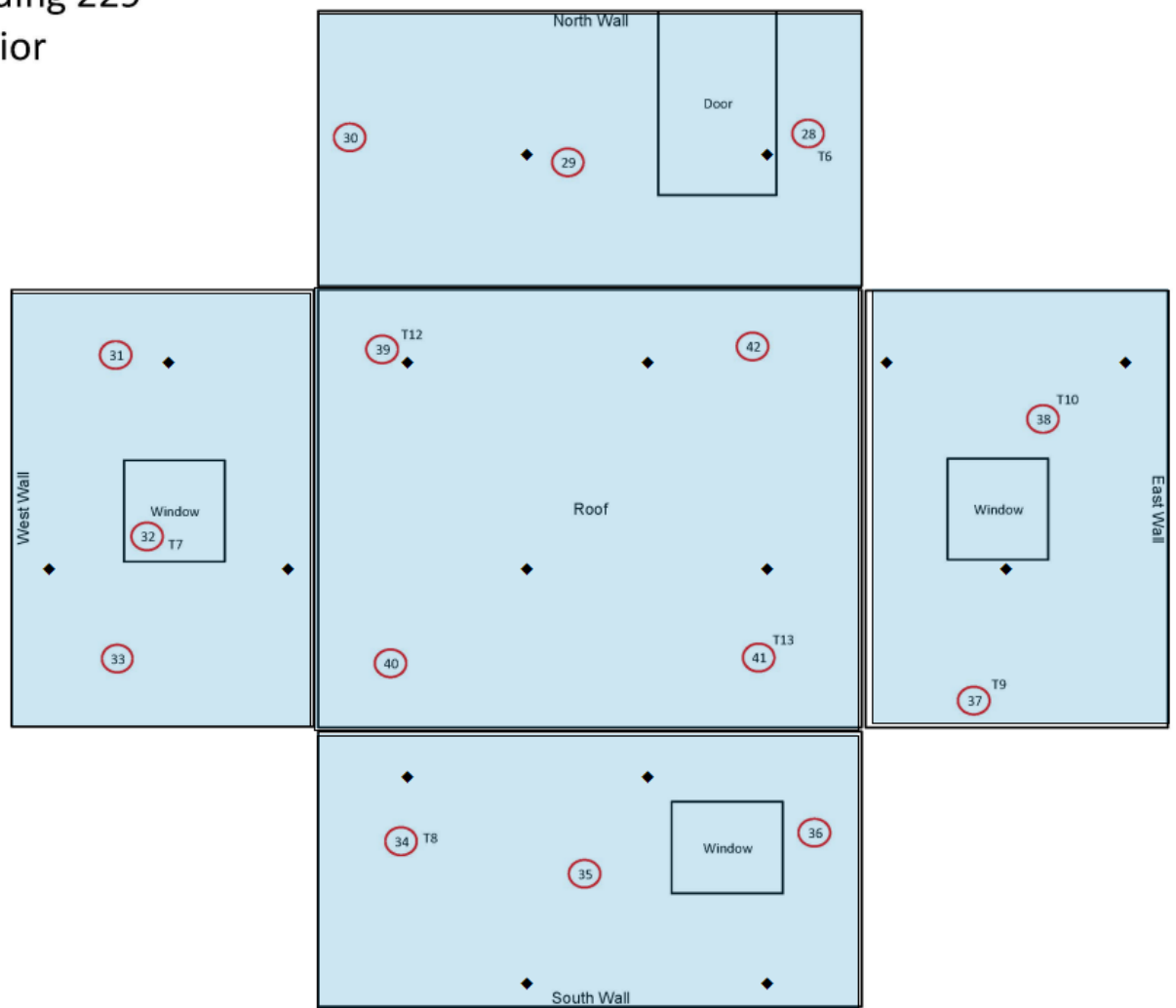


Figure 5. No additional sampling required in the shaded areas. VSP suggested sampling locations (black diamonds) are well-represented by the existing sampling locations (circled numbers).

TA-21 Building 387 Interior

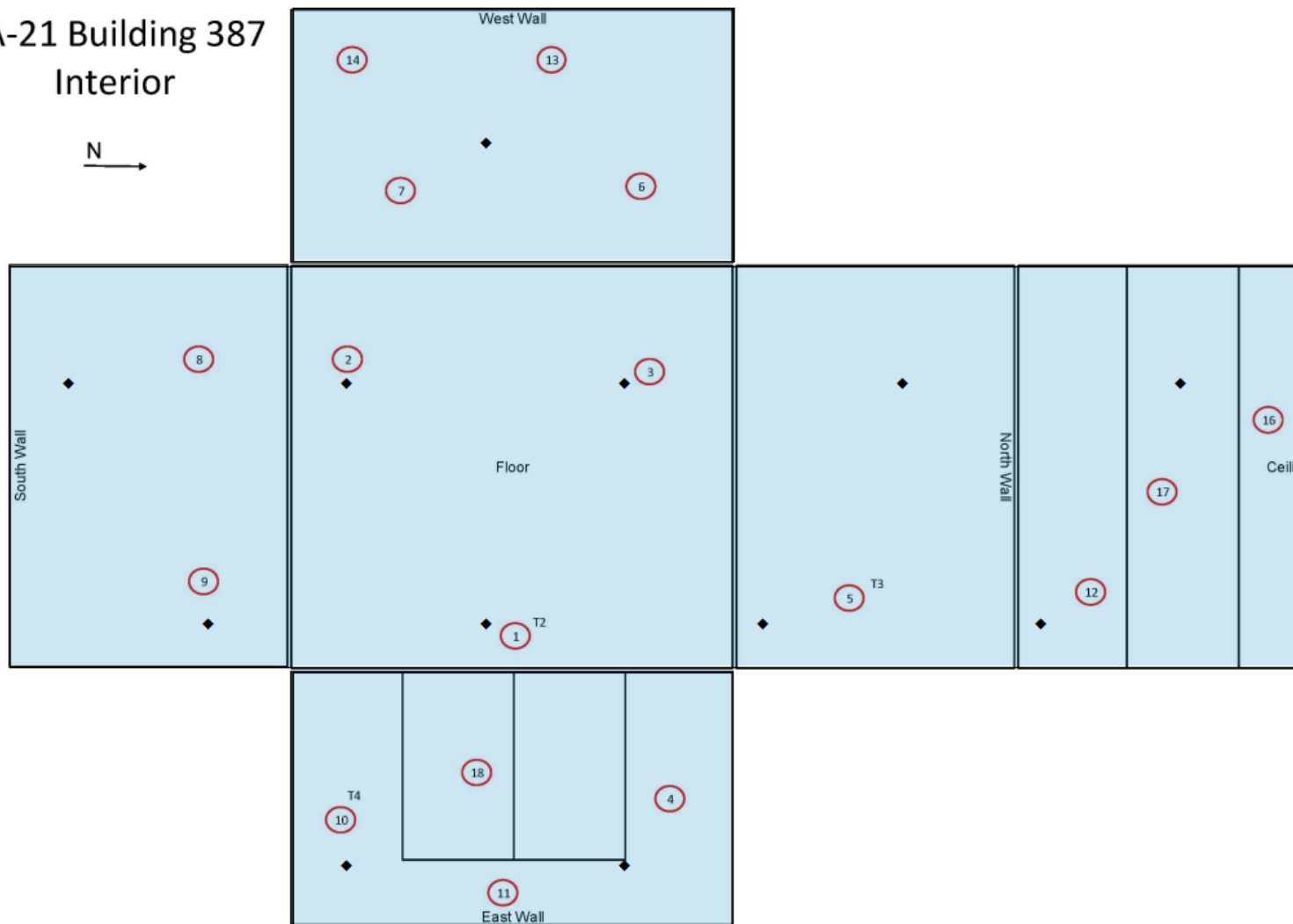


Figure 6. No additional sampling required in the shaded areas. VSP suggested sampling locations (black diamonds) are well-represented by the existing sampling locations (circled numbers).

TA-21 Building 387
Exterior

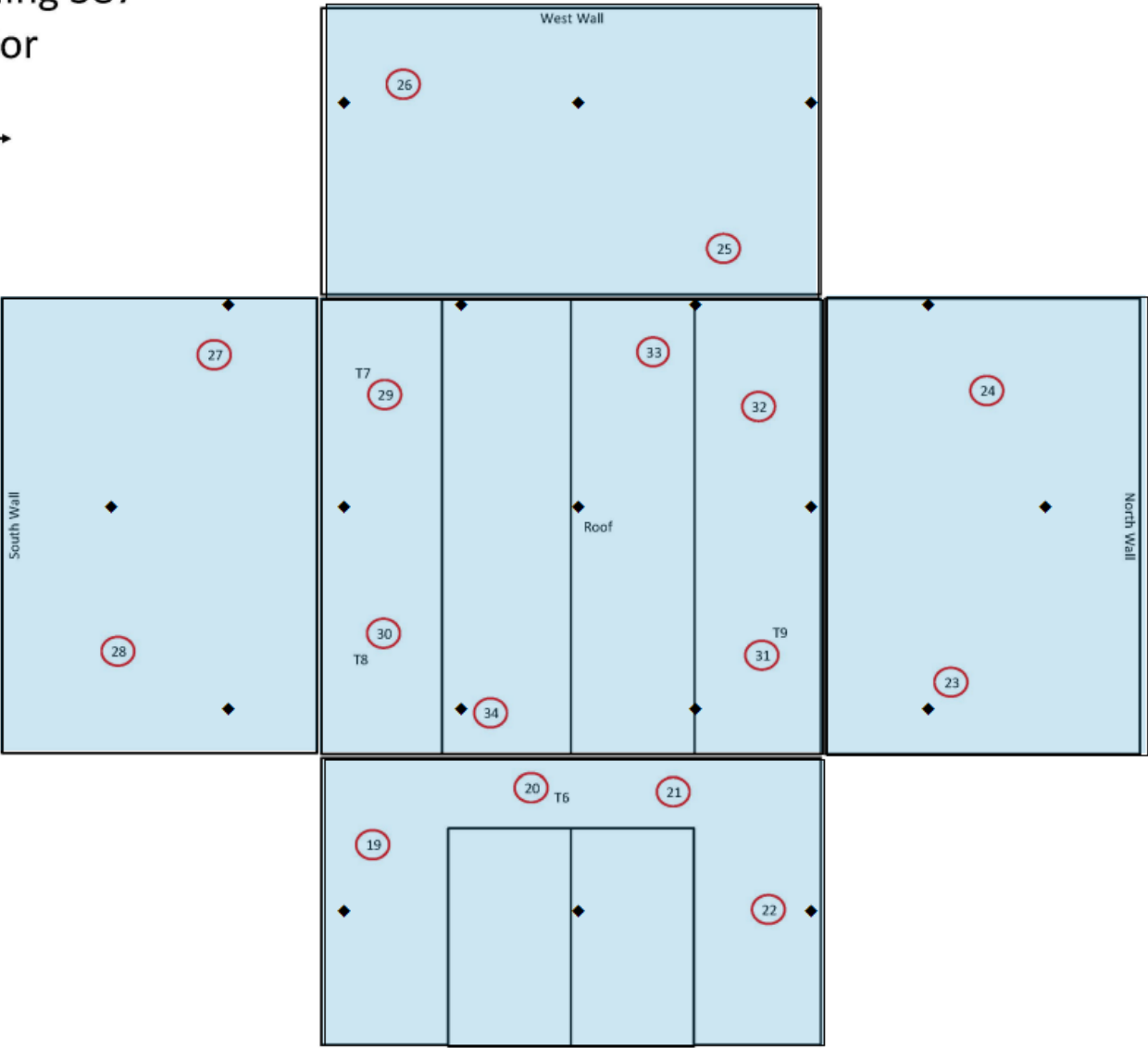


Figure 7. No additional sampling required in the shaded areas. VSP suggested sampling locations (black diamonds) are well-represented by the existing sampling locations (circled numbers).

Contamination/Radiation Survey Report 2015

RWP NUMBER : N/A TA-21 Building 227 Interior Characterization Survey

COPY Survey Form Revision 0

Survey Number:	Date/Time:	Item	Location	Alpha			Beta			Tritium	Dose Rate (mrem/hr)					
		#		Removable (dpm/100cm ²)	Direct (dpm/100cm ²)	Total (dpm/100cm ²) Removable + Direct	Removable (dpm/100cm ²)	Direct (dpm/100cm ²)	Total (dpm/100cm ²) Removable + Direct	Removable (dpm/100cm ²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma	1 Meter neutron
TA21-2015-00102	5/20/2015 @ 1500		TA-21 Building 227 Interior													
Location:	Surveyor:	1	Metal Plate	1.1	18.0	19.1	0.0	0.0	0.0	N/A						
TA-21 Building 227 Int.	B. Bonser / J. Luna	2	Metal Plate	0.0	7.0	7.0	6.1	0.0	6.1	N/A						
Survey Type:	Equipment	3	Metal Plate - T2	0.8	23.0	23.8	0.0	0.0	0.0	NDA						
Routine	Material Release	4	Pipe	1.2	35.0	36.2	0.0	0.0	0.0	N/A						
Pre-Job RWP	Material Receipt	5	Concrete	0.0	51.0	51.0	1.9	306.0	307.9	N/A						
Post-Job RWP	Vehicle Release	6	Concrete	0.0	46.0	46.0	0.0	242.0	242.0	N/A						
RMI	Vehicle Receipt	7	Pipe	1.2	46.0	47.2	0.0	79.0	79.0	N/A						
Drums	Characterization Survey	8	Pipe - T3	0.0	51.0	51.0	3.4	0.0	3.4	NDA		N				
Contamination	Radiation	9	Valve	0.0	18.0	18.0	0.0	0.0	0.0	N/A						
Characterization Survey of		10	Pipe	0.0	35.0	35.0	1.7	62.0	63.7	N/A						
TA-21 Building 227 Interior		11	Valve - T4	1.1	23.0	24.1	0.0	0.0	0.0	NDA						
Tritium smear #1 is blank.		12	Vent Pipe	0.0	1.0	1.0	3.6	0.0	3.6	N/A						
'T#' in the 'Location' column indicates the		13	Grating	0.8	29.0	29.8	0.0	48.0	48.0	N/A						
tritium smear # also taken at this sample location.		14	Concrete	0.0	63.0	63.0	3.2	483.0	486.2	N/A						
Completed a 10% Scan of all accesible surfaces.		15	Rail	0.0	12.0	12.0	3.6	0.0	3.6	N/A						
		16	Rail	1.3	29.0	30.3	0.6	0.0	0.6	N/A						
		17	Wall of Treatment Pit - N	1.2	N/A	1.2	0.0	N/A	0.0	N/A						
Instrument	P/N #	Cal Due	Bkgd	MDA	units	18	Wall of Treatment Pit - N	0.0	N/A	0.0	3.4	N/A	3.4	N/A		
E600	12013	9/29/2015	4.1	30	α dpm	19	Wall of Treatment Pit - E	2.3	N/A	2.3	0.5	N/A	0.5	N/A		
SHP380AB	12864	4/9/2016	1028	252	βdpm	20	Wall of Treatment Pit - S	2.7	N/A	2.7	1.5	N/A	1.5	N/A		
E600	12457	5/5/2016	27.2	53	α dpm	21	Wall of Treatment Pit - S	0.0	N/A	0.0	0.4	N/A	0.4	N/A		
SHP380AB	13461	4/14/2016	1163	267	βdpm	22	Concrete	0.0	79.0	79.0	0.0	252.0	252.0	N/A		
N					N/A	23	Wood - T5	2.3	12.0	14.3	0.8	21.0	21.8	NDA		
			A		N/A	24	Concrete	0.0	0.0	0.0	0.0	252.0	252.0	N/A		
						25	Concrete	0.0	57.0	57.0	1.0	300.0	301.0	N/A		
See attached data sheets.						26	Pipe	1.3	18.0	19.3	3.3	0.0	3.3	N/A		
						27	Metal Plate	0.0	29.0	29.0	0.2	7.0	7.2	N/A		
RCT Signature:						28	Metal Plate - T6	0.0	40.0	40.0	2.4	0.0	2.4	NDA		
Supervisor:	L. Priester / B. Mclean					29	Vent Pipe	1.0	1.0	2.0	0.0	0.0	0.0	N/A		A
Signature						30	Trough	0.0	13.0	13.0	3.5	103.0	106.5	N/A		
						31	Wall of Treatment Pit - N	1.1	N/A	1.1	3	N/A	3.0	N/A		
						32	Wall of Treatment Pit - S	1.2	N/A	1.2	0	N/A	0.0	N/A		
						33	Floor of Treatment Pit - N	0.8	N/A	0.8	0.9	N/A	0.9	N/A		
						34	Floor of Treatment Pit - S	0	N/A	0.0	0	N/A	0.0	N/A		
						35	Fiberglass Wall	0	18	18.0	0	35	35.0	N/A		
						36	Metal Vent Louver - T7	0	51	51.0	2.5	0	2.5	NDA		

See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

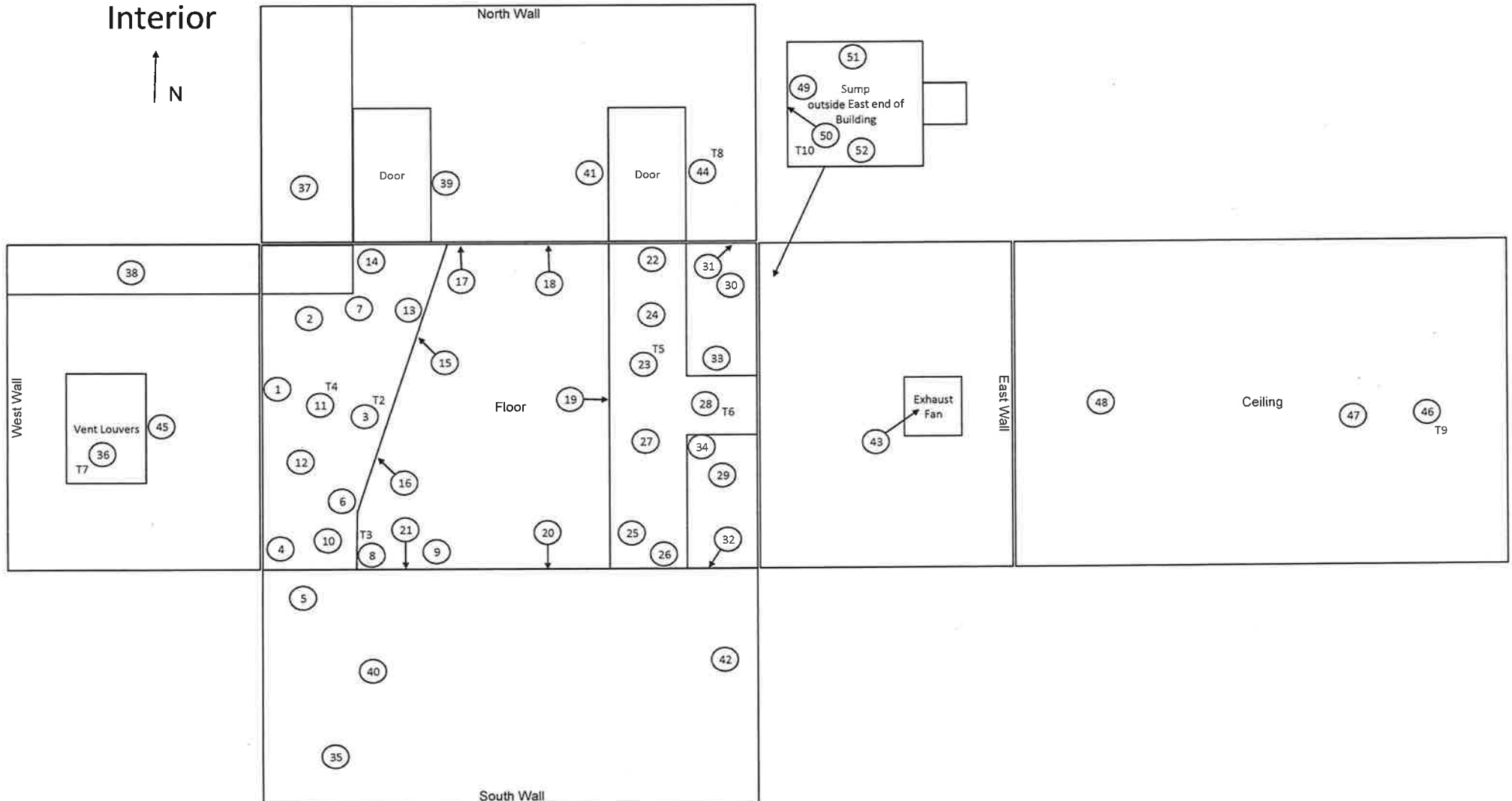
Survey Number: TA21-2015-00102	Date/Time: 5/20/2015 @ 1500	Comments: TA-21 Building 227 Interior Characterization Survey
Location: TA-21 Building 227 Interior	Surveyor: B. Bonser / J. Luna	

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00102	Date/Time: 5/20/2015 @ 1500	Comments: TA-21 Building 227 Interior Characterization Survey
Location: TA-21 Building 227 Interior	Surveyor: B. Bonser / J. Luna	

TA-21 Building 227

Interior



HPAL ANALYSIS REPORT

FILE: 29165391

Sample Description	Analysis Information		Contact Information
Login Date: 05/22/15	Instrument: Bertl 2010/143	Name: BONSER BRYAN H	
Sample Type: TWSR	Analysis: GrossAB	Phone: -	
Location TA:21 Bldg:227	Date: 05/22/15	Email: bbonser@lanl.gov	
Room: Interior	Analyst: HOMAN VICTORIA M		
Priority: Routine			
Comments:			

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity	2* sigma	Alpha MDA	Alpha MDA FLAG	Beta Activity	2* sigma	Beta MDA	Beta MDA Flag
	(dpm)	(dpm)	(dpm)		(dpm)	(dpm)	(dpm)	
1	1.1	1.4	6.4		0.0	166.0	12.5	
2	0.0	251.3	5.3		6.1	3.3	10.2	
3	0.8	1.4	7.1		0.0	174.1	12.3	
4	1.2	1.4	5.8		0.0	162.9	11.3	
5	0.0	258.5	6.1		1.9	2.9	10.9	
6	0.0	256.9	5.3		0.0	157.9	10.7	
7	1.2	1.4	5.7		0.0	163.1	11.9	
8	0.0	272.2	6.2		3.4	3.3	12	
9	0.0	246.4	6.2		0.0	158.5	10.8	
10	0.0	251.3	5.3		1.7	2.7	10.2	
11	1.1	1.4	6.4		0.0	166.0	12.5	
12	0.0	259.4	6		3.6	3.2	11.3	
13	0.8	1.4	7.1		0.0	174.1	12.3	
14	0.0	253.0	5.8		3.2	3.2	11.2	
15	0.0	258.5	6.1		3.6	3.1	10.9	
16	1.3	1.4	5.3		0.6	2.7	10.8	
17	1.2	1.4	5.7		0.0	163.1	11.9	
18	0.0	272.2	6.2		3.4	3.3	12	
19	2.3	1.9	6.2		0.5	2.7	10.8	
20	2.7	2.0	5.3		1.5	2.7	10.2	
21	0.0	257.8	6.4		0.4	3.1	12.5	
22	0.0	259.4	6		0.0	173.4	11.3	
23	2.3	2.0	7.1		0.8	3.1	12.3	
24	0.0	253.0	5.8		0.0	162.9	11.2	
25	0.0	258.5	6.1		1.0	2.7	10.9	
26	1.3	1.4	5.3		3.3	3.1	10.8	
27	0.0	251.0	5.7		0.2	2.9	11.9	
28	0.0	272.2	6.2		2.4	3.2	12	
29	1.0	1.4	6.2		0.0	158.5	10.8	
30	0.0	251.3	5.3		3.5	2.9	10.2	
31	1.1	1.4	6.4		3.0	3.5	12.5	
32	1.2	1.4	6		0.0	173.4	11.3	
33	0.8	1.4	7.1		0.9	3.1	12.3	
34	0.0	253.0	5.8		0.0	162.9	11.2	
35	0.0	258.5	6.1		0.0	155.2	10.9	
36	0.0	256.9	5.3		2.5	2.9	10.7	
37	0.0	251.0	5.7		0.0	163.1	11.9	
38	0.0	272.2	6.2		0.0	166.2	12	

HPAL ANALYSIS REPORT

FILE: 29165391

Sample Description	Analysis Information	Contact Information
LogIn Date: 05/22/15	Instrument: Bertl 2010/143	Name: BONSER BRYAN H
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA:21 Bldg:227	Date: 05/22/15	Email: bbonser@lanl.gov
Room:Interior	Analyst:HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA FLAG	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA FLAG
39	1.0	1.4	6.2		0.0	158.5	10.8	
40	1.3	1.4	5.3		0.0	158.2	10.2	
41	0.0	257.8	6.4		0.0	166.0	12.5	
42	0.0	259.4	6		0.0	173.4	11.3	
43	0.8	1.4	7.1		4.8	3.6	12.3	
44	0.0	253.0	5.8		3.2	3.2	11.2	
45	0.0	258.5	6.1		0.0	155.2	10.9	
46	0.0	256.9	5.3		0.0	157.9	10.7	
47	0.0	251.0	5.7		0.0	163.1	11.9	
48	0.0	272.2	6.2		1.5	3.1	12	
49	1.0	1.4	6.2		4.2	3.2	10.8	
50	0.0	251.3	5.3		0.0	158.2	10.2	
51	0.0	257.8	6.4		0.0	166.0	12.5	
52	0.0	259.4	6		6.5	3.6	11.3	

HPAL ANALYSIS REPORT

FILE: 29165395

Sample Description		Analysis Information		Contact Information	
Login Date: 05/22/15		Instrument: TA3TC3		Name: BONSER BRYAN H	
Sample Type: Trit. Smear		Analysis: Liquid Scint.		Phone: -	
Location TA:21 Bldg:227		Date: 05/22/15		Email: bbonser@lanl.gov	
Room: Interior		Analyst: GARCIA FRANCISCO L			
Priority: Routine					
Comments:					
LID (cpm): Alpha=16 Beta=15					

Sample ID	Alpha Activity	2* sigma	H-3 Beta Activity	2* sigma	Total Beta Activity	2* sigma
1	NDa	NDa	NDa	NDa	NDa	NDa
2	NDa	NDa	NDa	NDa	NDa	NDa
3	NDa	NDa	NDa	NDa	NDa	NDa
4	NDa	NDa	NDa	NDa	NDa	NDa
5	NDa	NDa	NDa	NDa	NDa	NDa
6	NDa	NDa	NDa	NDa	NDa	NDa
7	NDa	NDa	NDa	NDa	NDa	NDa
8	NDa	NDa	NDa	NDa	NDa	NDa
9	NDa	NDa	NDa	NDa	NDa	NDa

HPAL ANALYSIS REPORT

FILE: 29164380

Sample Description	Analysis Information	Contact Information
Login Date: 05/29/15	Instrument: TA3TC3	Name: PRIESTER LEROY JR.
Sample Type: Trlt. Smear	Analysis: Liquid Scint.	Phone: 500-7373
Location TA:21 Bldg:n/a	Date: 06/01/15	Email: lpriesterjr@lanl.gov
Room: sump	Analyst: CHAVEZ MELISSA F	
Priority: Routine		
Comments:		

LID (cpm): Alpha=16 Beta=15

Sample ID	Alpha Activity (dpm)	2* sigma (%)	H-3 Beta Activity (dpm)	2* sigma (%)	Total Beta Activity (dpm)	2* sigma (%)
1	NDA	NDA	NDA	NDA	NDA	NDA
10	NDA	NDA	NDA	NDA	NDA	NDA

10
6.3.15

HPAL ANALYSIS REPORT

FILE: 29164378

Sample Description	Analysis Information	Contact Information
Login Date: 05/29/15	Instrument: LOAX-2	Name: PRIESTER LEROY JR.
Sample Type: Liquid	Analysis: Isotopic	Phone: 500-7373
Location TA:21 Bldg:n/a	Date: 06/02/15	Email: lpriesterjr@lanl.gov
Room: sump	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Sample ID or Description: 4. Analysis modified.

Isotope Name	Activity (dpm)	2* sigma (dpm)	MDA (dpm)
NONE -	NDA	NDA	NDA

HPAL ANALYSIS REPORT

FILE: 29164378

Sample Description	Analysis Information	Contact Information
Login Date: 05/29/15	Instrument: TA3TC3	Name: PRIESTER LEROY JR.
Sample Type: Liquid	Analysis: Liquid Scint.	Phone: 500-7373
Location TA:21 Bldg:n/a	Date: 06/01/15	Email: lpriesterjr@lanl.gov
Room: sump	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		


LID (cpm): Alpha=14 Beta=12

Sample ID	Alpha Activity	2* sigma	H-3 Beta Activity	2* sigma	Total Beta Activity	2* sigma
	(uCi/L)	(%)	(uCi/L)	(%)	(uCi/L)	(%)
1	NDA	NDA	NDA	NDA	NDA	NDA
2	NDA	NDA	NDA	NDA	NDA	NDA
3	NDA	NDA	NDA	NDA	NDA	NDA
4*	NDA	NDA	NDA	NDA	NDA	NDA

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-20-2015 @ 1000 No. of Samples: 52
 TA: 21 Bldg: 227 Room: Interior
 Submitter: Bryan Bonser Z No: 269854
 Signature: _____
 Contact Name: L. Priestler Z No: 259816
 Phone/Page/Email: L. Priestler 505-500-7373

☐ Priority ☐ Emergency

RP Tracking Number 21-227
PUCO

 29165391

Sample Type & Analysis (Check Box and provide additional information if needed)

Gross α/β	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

N/A

Comments/RPO RWP No:

- 1) Isotope(s): Pu, U
- 2) Field Screen (dpm): <1000 ☐ alpha ☐ beta ☒ α/β
- 3) STC Type: None or list type _____
- 4) Describe: _____

Reporting Units:
☒ dpm ☐ μ Ci ☐ nCi ☐ dpm/m³ ☐ μ Ci/L ☐ pCi/g

☐ Any Samples with $\geq 20K$ dpm alpha, $\geq 100K$ dpm beta/gamma, or $\geq 400K$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1	1-52	5-20-2015 @ 1000
2		
3		
4		
5		

CAM FILTER/AIR SAMPLES/CHARCOALS

Flow Rate Units: ☐ cfm ☐ ipm

Location	Sample On	Sample Off	Run Time
Date	Time	Date	Time
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

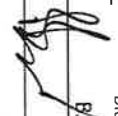
NASAL SMEAR

Type: ☐ Routine ☐ Special

Name	Z Number	Group	Respirator	Date	Time
1			<input type="checkbox"/>		
2			<input type="checkbox"/>		
3			<input type="checkbox"/>		
4			<input type="checkbox"/>		
5			<input type="checkbox"/>		
6			<input type="checkbox"/>		
7			<input type="checkbox"/>		
8			<input type="checkbox"/>		
9			<input type="checkbox"/>		
10			<input type="checkbox"/>		

☐ Continuation

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-20-2015 @ 1000 No. of Samples: 9
 TA: 21 Bldg: 227 Room: Interior
 Submitter: B. Bonser Z No: 269854
 Signature: 
 Contact Name: L. Priester Z No: 259816
 Phone/Page/E-mail: L. Priester 505-500-7373

☐ Priority ☐ Emergency

IN WORKING MEMORY

 29165395
 21-227
 T-5
 H3

Sample Type & Analysis (Check Box and provide additional information if needed)

Gross α/β	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 1) Isotope(s): Pu, U, H3
 2) Field Screen (dpm): ☐ alpha ☐ beta ☐ α/β
 3) STC Type: None or list type
 4) Describe:

Comments/RPO RWP No:

#1 is a blank.

Reporting Units:
☒ dpm ☐ μ Ci ☐ nCi ☐ dpm/m³ ☐ μ Ci/L ☐ pCi/g

☐ Any Samples with $\geq 20K$ dpm alpha, $\geq 100K$ dpm beta/gamma, or $\geq 400K$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1 1-9	5-20-2015 @ 1000	TA21-227 Interior
2		
3		
4		
5		
6		
7		
8		
9		
10		

CAM FILTER/AIR SAMPLES/CHARCOALS

Location	Flow Rate Units:		Run Time (hr)
	<input type="checkbox"/> cfm	<input type="checkbox"/> lpm	

	Date	Time	Flow Rate	Date	Time	Flow Rate	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

NASAL SMEAR

Name

Z Number

Group

Type: ☐ Routine ☐ Special

Respirator

Date

Time


	Date	Time	Flow Rate	Date	Time	Flow Rate	Run Time (hr)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-29-2015 @ 1000 No. of Samples: 2

TA: 21 Bldg: 227 Room: Sump (Int)

Submitter: B. Bonser Z No: 269854

Signature: 

Contact Name: L. Priester Z No: 259816

Phone/Page/Email: L. Priester 505-500-7373

☐ Priority ☐ Emergency



29164380

Sample Type & Analysis (Check box and provide additional information if needed)

	NUCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
Gross α/β	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#1 is a blank.

1) Isotope(s): Pu, U, H3 ☐ alpha ☐ beta ☐ α/β

2) Field Screen (dpm): _____

3) STC Type: None or list type _____

4) Describe: _____

Reporting Units:
☒ dpm ☐ μCi ☐ nCi ☐ dpm/m³ ☐ $\mu\text{Ci/L}$ ☐ pCi/g

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

Sample ID		Date/Time	Description	SMEARS/LIQUID/OTHER					
1	1	5-29-2015 @ 1000	Blank						
2	2	5-29-2015 @ 1000	Building 227 Sump Below Trough (Int. T-10)						
3									
4									
5									
6									
7									
8									
9									
10									

CAM FILTER/AIR SAMPLES/CHARCOALS		Flow Rate Units:					
Location	Date	Sample On Time	Flow Rate	Date	Sample Off Time	Flow Rate	Run Time (hr)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

NASAL SMEAR		Type:		
Name	Z Number	Group	Routine <input type="checkbox"/>	Special <input type="checkbox"/>
1			<input type="checkbox"/>	
2			<input type="checkbox"/>	
3			<input type="checkbox"/>	
4			<input type="checkbox"/>	
5			<input type="checkbox"/>	
6			<input type="checkbox"/>	
7			<input type="checkbox"/>	
8			<input type="checkbox"/>	
9			<input type="checkbox"/>	
10			<input type="checkbox"/>	

Contamination/Radiation Survey Report 2015

OPY
Survey Form Revision 0

RWP NUMBER : N/A TA-21 Building 227 Exterior Characterization Survey

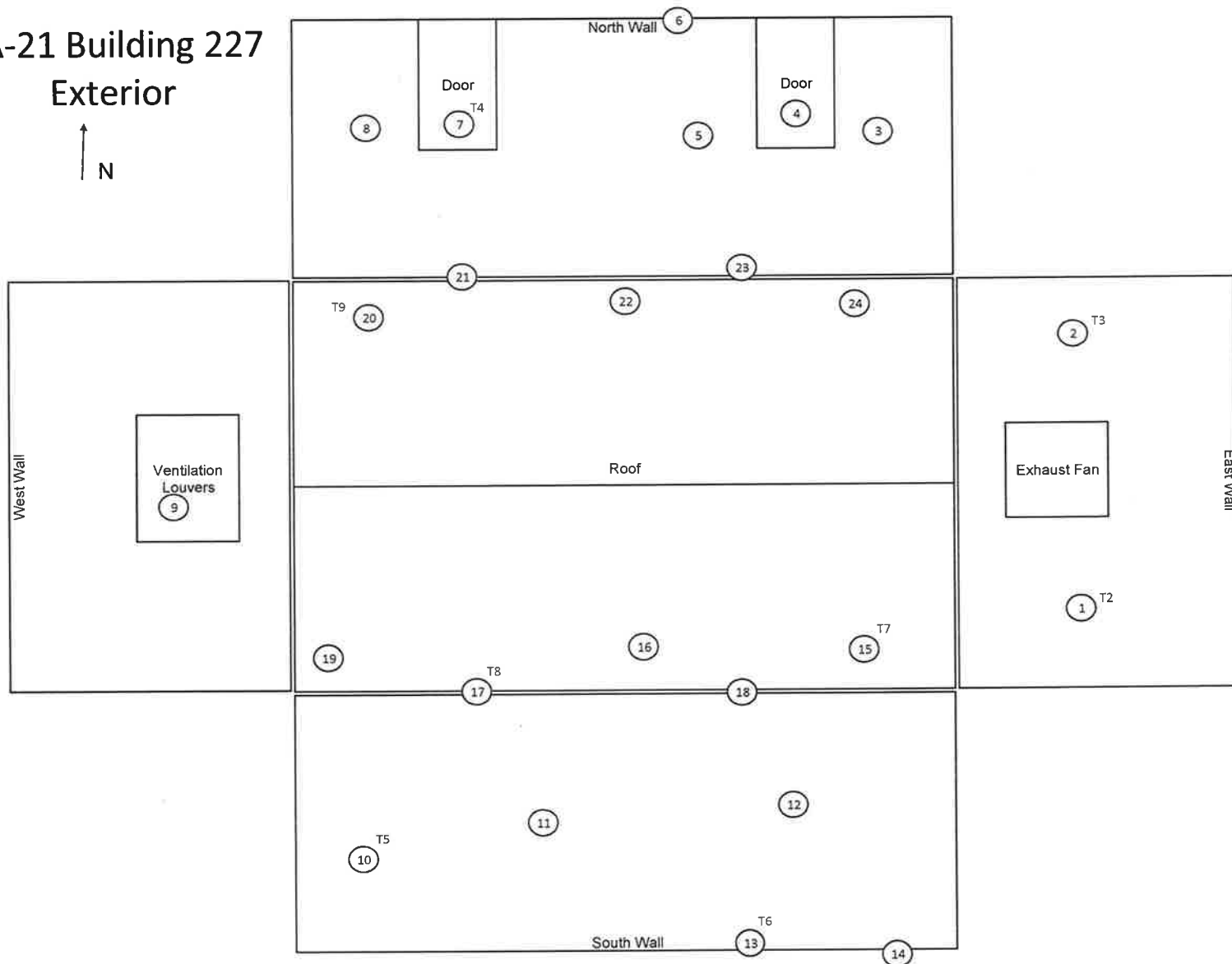
Survey Number:	Date/Time:	Item	Location	Alpha			Beta			Tritium	Dose Rate (mrem/hr)					
		#		Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma	1 Meter neutron
TA21-2015-00103	5/20/2015 @ 1500	1	TA-21 Building 227 Exterior													
Location:	Surveyor:	2	East wall - Al siding - T2	0.0	2.0	2.0	0.1	0.0	0.1	NDA						
TA-21 Bldg 227 Ext.	B. Bonser / J. Luna	3	East wall - Al siding - T3	1.2	19.0	20.2	0.0	0.0	0.0	NDA						
Survey Type:	Equipment	4	North wall - Al siding	1.1	0.0	1.1	2.6	0.0	2.6	N/A						
Routine	Material Release	5	Painted metal door	0.0	0.0	0.0	0.0	0.0	0.0	N/A						
Pre-Job RWP	Material Receipt	6	North wall - Al siding	0.0	7.0	7.0	0.0	0.0	0.0	N/A						
Post-Job RWP	Vehicle Release	7	Concrete footing	0.0	30.0	30.0	1.5	531.0	532.5	N/A						
RMI	Vehicle Receipt	8	Painted metal door - T4	1.0	0.0	1.0	0.0	0.0	0.0	NDA						
Drums	Characterization Survey	9	North wall - Al siding	0.0	47.0	47.0	0.0	0.0	0.0	N/A		N				
Contamination	Radiation	10	Ventilation louvers	0.0	58.0	58.0	0.0	86.0	86.0	N/A						
Characterization Survey of		11	South wall - fiberglass - T5	0.0	0.0	0.0	2.7	0.0	2.7	NDA						
TA-21 Building 227 Exterior		12	South wall - wood	0.8	2.0	2.8	0.0	39.0	39.0	N/A						
Tritium #1 is a blank.		13	South wall - fiberglass	0.0	7.0	7.0	0.5	0.0	0.5	N/A						
'T#' in the 'Location' column indicates the		14	South wall - metal flashing - T6	0.0	164.0	164.0	0.0	253.0	253.0	NDA						
tritium smear # also taken at this sample location.		15	South wall - concrete footing	0.0	35.0	35.0	0.8	412.0	412.8	N/A						
Completed a 10% Scan of all accesible surfaces.		16	Roof - bare wood - T7	2.6	31.0	33.6	0.0	0.0	0.0	NDA						
		17	Roof - bare wood	1.3	25.0	26.3	0.0	0.0	0.0	N/A						
		18	Fascia - rusted metal - T8	1.0	142.0	143.0	0.0	0.0	0.0	NDA						
		19	Fascia - rusted metal	2.7	142.0	144.7	0.0	0.0	0.0	N/A						
		20	Roof - bare wood	0.0	36.0	36.0	0.0	0.0	0.0	N/A						
		21	Roof - asphalt shingle - T9	1.2	53.0	54.2	1.5	470.0	471.5	NDA						
		22	Fascia - rusted metal	0.8	75.0	75.8	4.8	0.0	4.8	N/A						
		23	Roof - asphalt shingle	0.0	8.0	8.0	5.1	269.0	274.1	N/A						
		24	Soffet - Oriented Strand Board	2.6	14.0	16.6	0.7	0.0	0.7	N/A						
		25	Roof - asphalt shingles	0.0	44.0	44.0	0.0	252.0	252.0	N/A						
		26	End of Survey	N/A	N/A	N/A	N/A	N/A	N/A	N/A						
See attached data sheets.		27														
		28														
		29														
		30														
		31														
		32														
		33														
		34														
		35														
		36														

See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00103	Date/Time: 5/20/2015 @ 1500	Comments: TA-21 Building 227 Exterior Characterization Survey
Location: TA-21 Building 227 Exterior	Surveyor: B. Bonser / J. Luna	

TA-21 Building 227 Exterior



HPAL ANALYSIS REPORT

FILE: 29165392

Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: Bertl 2010/143	Name: BONSER BRYAN H
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA:21 Bldg:227	Date: 05/22/15	Email: bbonser@lanl.gov
Room:Exterior	Analyst:HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity	2* sigma	Alpha MDA	Alpha MDA FLAG	Beta Activity	2* sigma	Beta MDA	Beta MDA FLAG
	(dpm)	(dpm)	(dpm)		(dpm)	(dpm)	(dpm)	
1	0.0	259.2	7.1		0.1	2.9	12.3	
2	1.2	1.4	5.8		0.0	162.9	11.3	
3	1.1	1.4	6.1		2.6	3.0	10.9	
4	0.0	256.9	5.3		0.0	157.9	10.7	
5	0.0	251.0	5.7		0.0	163.1	11.9	
6	0.0	272.2	6.2		1.5	3.1	12	
7	1.0	1.4	6.2		0.0	158.5	10.8	
8	0.0	251.3	5.3		0.0	158.2	10.2	
9	0.0	257.8	6.4		0.0	166.0	12.5	
10	0.0	259.4	6		2.7	3.1	11.3	
11	0.8	1.4	7.1		0.0	174.1	12.3	
12	0.0	253.0	5.8		0.5	2.7	11.2	
13	0.0	258.5	6.1		0.0	155.2	10.9	
14	0.0	256.9	5.3		0.8	2.7	10.7	
15	2.6	2.0	5.7		0.0	163.1	12	
16	1.3	1.5	6.2		0.0	166.2	12	
17	1.0	1.4	6.2		0.0	158.5	10.8	
18	2.7	2.0	5.3		0.0	158.2	10.2	
19	0.0	257.8	6.4		0.0	166.0	12.5	
20	1.2	1.4	6		1.5	2.9	11.3	
21	0.8	1.4	7.1		4.8	3.6	12.3	
22	0.0	253.0	5.8		5.1	3.4	11.2	
23	2.6	2.0	6.1		0.7	2.8	10.9	
24	0.0	256.9	5.3		0.0	157.9	10.7	

HPAL ANALYSIS REPORT

FILE: 29165396

Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: TA3TC3	Name: BONSER BRYAN H
Sample Type: Trit. Smear	Analysis: Liquid Scint.	Phone: -
Location TA:21 Bldg:227	Date: 05/22/15	Email: bbonser@lanl.gov
Room:	Analyst: GARCIA FRANCISCO L	
Priority: Routine		
Comments:		

LLD (cpm): Alpha=16 Beta=15

Sample ID	Alpha Activity (dpm)	2* sigma (%)	H-3 Beta Activity (dpm)	2* sigma (%)	Total Beta Activity (dpm)	2* sigma (%)
1	NDA	NDA	NDA	NDA	NDA	NDA
2	NDA	NDA	NDA	NDA	NDA	NDA
3	NDA	NDA	NDA	NDA	NDA	NDA
4	NDA	NDA	NDA	NDA	NDA	NDA
5	NDA	NDA	NDA	NDA	NDA	NDA
6	NDA	NDA	NDA	NDA	NDA	NDA
7	NDA	NDA	NDA	NDA	NDA	NDA
8	NDA	NDA	NDA	NDA	NDA	NDA
9	NDA	NDA	NDA	NDA	NDA	NDA

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-20-2015 @ 1100 No. of Samples: 24
 TA: 21 Bldg: 227 Room: Exterior
 Submitter: Brian Bonser Z No: 269854
 Signature: *[Signature]*
 Contact Name: L. Priester Z No: 259816
 Phone/Page/Email: L. Priester 505-500-7373

☐ Priority ☐ Emergency

RP Tracking Number 21-227
 29165392
[Barcode]
[Signature]

Sample Type & Analysis (Check Box and provide additional information if needed)

Gross α/β	NuCon	Air Filter	H-3 Smear (3)	liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
LSC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments/RPO RWP No:

N/A

- 1) Isotope(s): Pu, U
- 2) Field Screen (dpm): <1000 ☐ alpha ☐ beta ☒ α/β
- 3) STC Type: None or list type
- 4) Describe:

Reporting Units:
☒ dpm ☐ μ Ci ☐ nCi ☐ dpm/m³ ☐ μ Ci/L ☐ pCi/g

☐ Any Samples with $\geq 20K$ dpm alpha, $\geq 100K$ dpm beta/gamma, or $\geq 400K$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1 1-24	5-20-2015 @ 1100	TA21-227 Exterior
2		
3		
4		
5		

CAM FILTER/AIR SAMPLES/CHARCOALS

Flow Rate Units:

☐ cfm ☐ ipm



Location	Sample On		Sample Off		Run Time (hr)
	Date	Time	Date	Time	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

NASAL SMEAR

Type: ☐ Routine ☐ Special

Name	Z Number	Group	Respirator	Date	Time
1			<input type="checkbox"/>		
2			<input type="checkbox"/>		
3			<input type="checkbox"/>		
4			<input type="checkbox"/>		
5			<input type="checkbox"/>		
6			<input type="checkbox"/>		
7			<input type="checkbox"/>		
8			<input type="checkbox"/>		
9			<input type="checkbox"/>		
10			<input type="checkbox"/>		

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-20-2015 @ 1500	No. of Samples: 9	<input type="checkbox"/> Priority	<input type="checkbox"/> Emergency
TA: 21	Bldg: 227	Room: Exterior	Tracking Number
Submitter: L. Bonser	Z No: 269854	RP Tracking Number 21-227	
Signature: 		 6471 H3	
Contact Name: L. Priestester	Z No: 259816	29165396	
Phone/Page/Email: L. Priestester 505-500-7373	Comments/RPO RWP No:		

Sample Type & Analysis (Check Box and provide additional information if needed)

	NuCon	Air Filter	H-3 Smear (3)	liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
Gross α/β	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1) Isotope(s): Pu, U, H3 ☐ alpha ☐ beta ☐ α/β

2) Field Screen (dpm): _____

3) STC Type: None or list type _____

4) Describe: _____

Reporting Units:
☒ dpm ☐ μCi ☐ mCi ☐ dpm/m³ ☐ $\mu\text{Ci/L}$ ☐ pCi/g

#1 is a blank.

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

Sample ID		Date/Time	SMEARS/LIQUID/OTHER				Description			
1	1-9	5-20-2015 @ 1500					TA21-227 Exterior			
2										
3										
4										
5										
6										
7										
8										
9										
10										

CAM FILTER/AIR SAMPLES/CHARCOALS		Flow Rate Units:							
Location	Date	Sample On		Sample Off		Run Time (hr)			
		Time	Flow Rate	Time	Flow Rate				
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

NASAL SMEAR		Type:	Respirator		Date	Time
Name	Z Number	<input type="checkbox"/> Routine <input type="checkbox"/> Special	<input type="checkbox"/> Routine <input type="checkbox"/> Special			
1		<input type="checkbox"/>	<input type="checkbox"/>			
2		<input type="checkbox"/>	<input type="checkbox"/>			
3		<input type="checkbox"/>	<input type="checkbox"/>			
4		<input type="checkbox"/>	<input type="checkbox"/>			
5		<input type="checkbox"/>	<input type="checkbox"/>			
6		<input type="checkbox"/>	<input type="checkbox"/>			
7		<input type="checkbox"/>	<input type="checkbox"/>			
8		<input type="checkbox"/>	<input type="checkbox"/>			
9		<input type="checkbox"/>	<input type="checkbox"/>			
10		<input type="checkbox"/>	<input type="checkbox"/>			

[illegible]

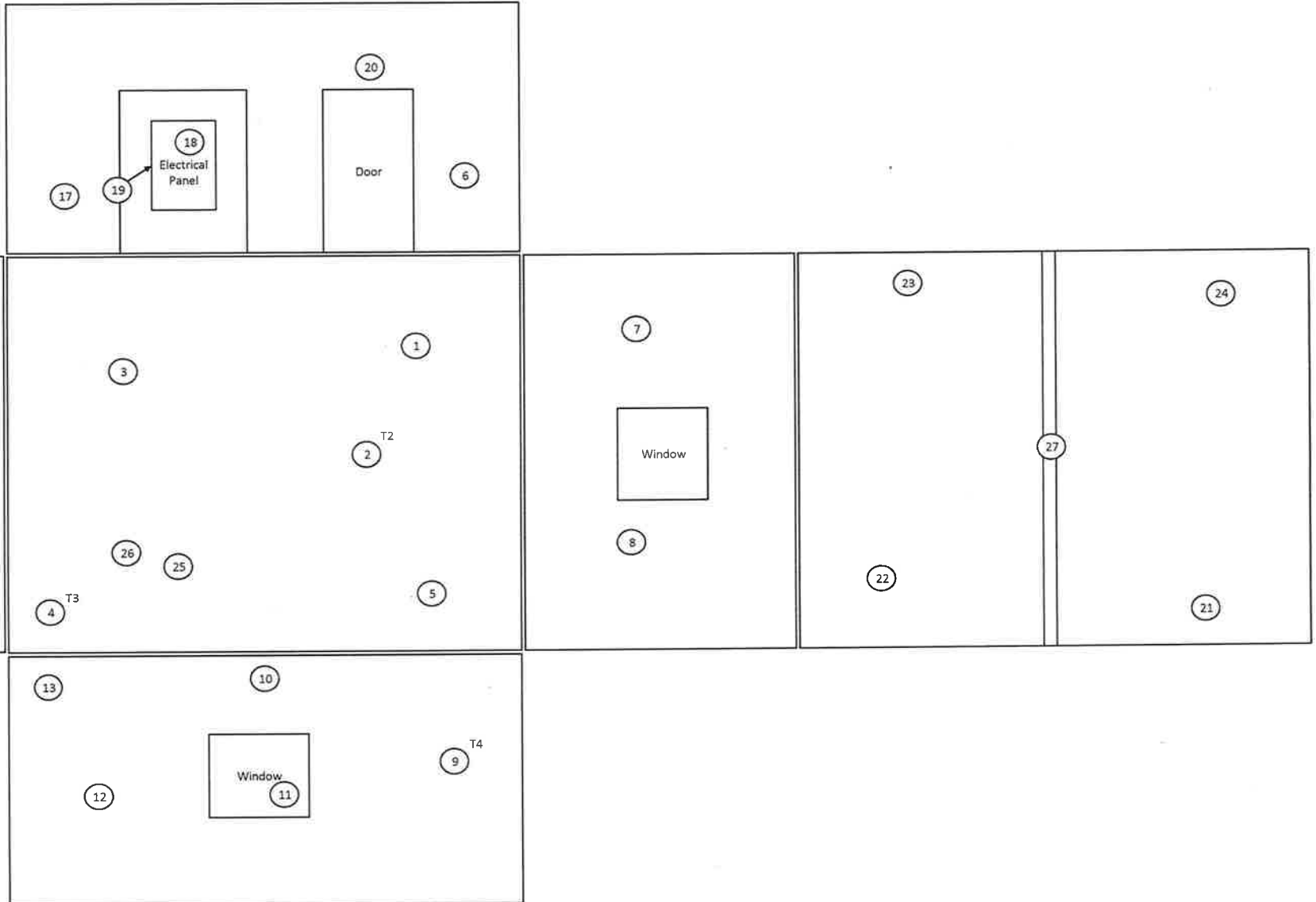
Survey Number:	
TA21-2015-00104	
Location:	
TA-21 Building 229	
Item	Location
#	TA-21 Building 229
37	N. Wall exterior - Al siding - T9
38	N. Wall exterior - Al siding - T10
39	Roof - metal - T12
40	Roof - metal
41	Roof - metal - T13
42	Roof - metal
43	End of Survey
44	
45	
46	
47	
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70	
71	

[illegible][illegible]

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00104	Date/Time: 5/20/2015 @ 1100	Comments: TA-21 Building 229 Characterization Survey
Location: TA-21 Building 229	Surveyor: B. Bonser / J. Luna	

TA-21
Building 229
Interior

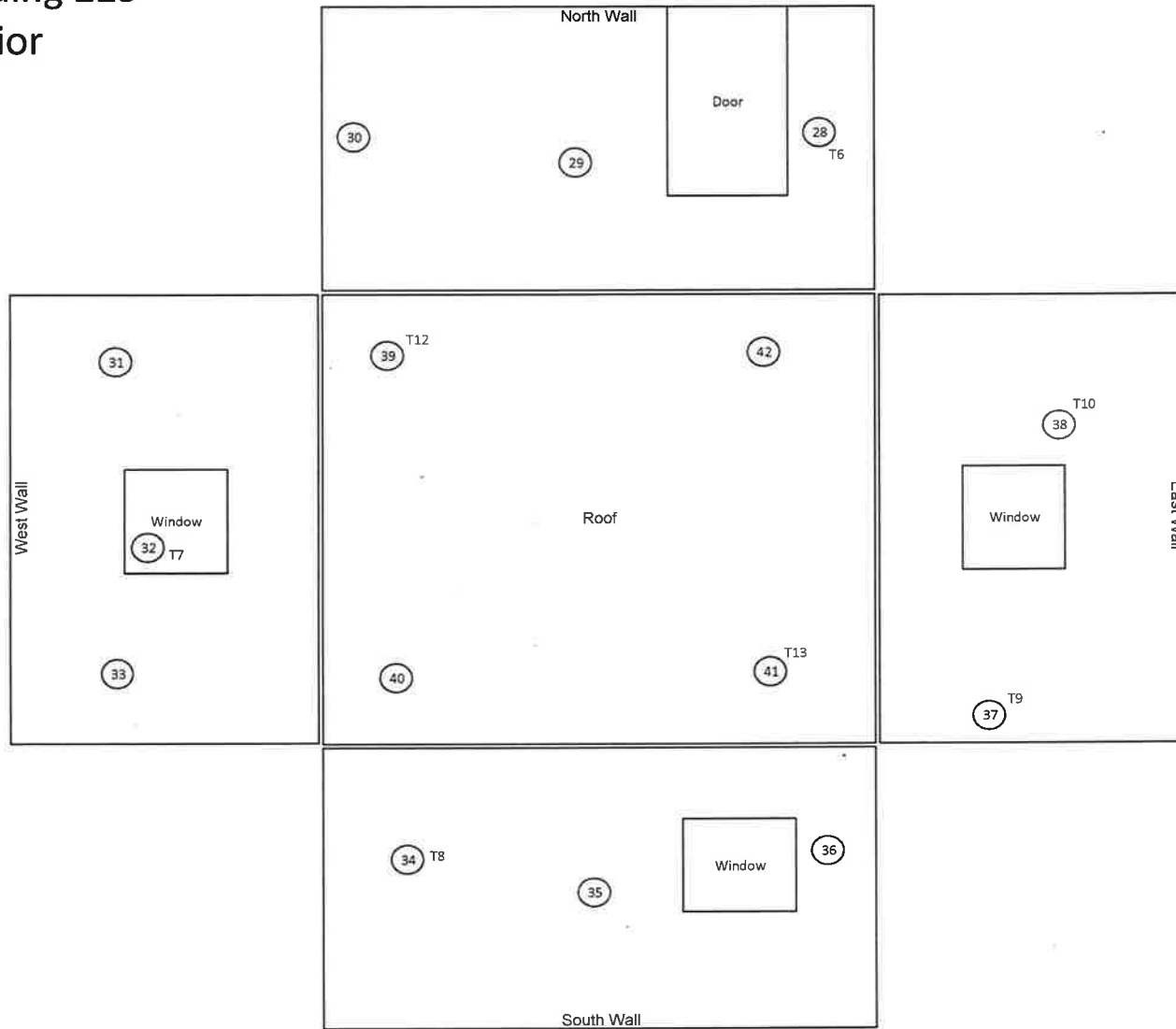


Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00104	Date/Time: 5/20/2015 @ 1100	Comments: TA-21 Building 229 Characterization Survey
Location: TA-21 Building 229	Surveyor: B. Bonser / J. Luna	

TA-21 Building 229

Exterior



HPAL ANALYSIS REPORT

FILE: 29165393

Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: Bertl 2010/143	Name: BONSER BRYAN H
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA:21 Bldg:229	Date: 05/22/15	Email: bbonser@lanl.gov
Room:N/A	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA FLAG	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA FLAG
1	0.0	246.4	6.2		3.4	3.1	10.8	
2	0.0	251.3	5.3		0.0	158.2	10.2	
3	1.1	1.4	6.4		0.0	166.0	12.5	
4	1.2	1.4	6		0.0	173.4	11.3	
5	0.0	259.2	7.1		6.9	3.9	12.3	
6	1.2	1.4	5.8		0.0	162.9	11.3	
7	0.0	258.5	6.1		0.0	155.2	10.9	
8	0.0	256.9	5.3		0.0	157.9	10.7	
9	1.2	1.4	5.7		0.0	163.1	11.9	
10	0.0	272.2	6.2		2.4	3.2	12	
11	2.3	1.9	6.2		0.0	158.5	10.8	
12	0.0	251.3	5.3		0.0	158.2	10.2	
13	0.0	257.8	6.4		0.0	166.0	12.5	
14	2.6	2.0	6		4.3	3.4	11.3	
15	0.0	259.2	7.1		1.0	3.1	12.3	
16	0.0	253.0	5.8		1.4	2.9	11.2	
17	0.0	258.5	6.1		0.0	155.2	10.9	
18	1.3	1.4	5.3		1.5	2.8	10.8	
19	0.0	251.0	5.7		0.0	163.1	11.9	
20	1.3	1.5	6.2		0.0	166.2	12	
21	0.0	246.4	6.2		2.5	2.9	10.8	
22	0.0	251.3	5.3		0.0	158.2	10.2	
23	0.0	257.8	6.4		3.2	3.5	12.5	
24	0.0	259.4	6		0.8	2.7	11.3	
25	0.8	1.4	7.1		0.0	174.1	12.3	
26	0.0	253.0	5.8		0.0	162.9	11.2	
27	1.1	1.4	6.1		0.0	155.2	10.9	
28	2.7	2.0	5.3		0.0	157.9	10.8	
29	1.2	1.4	5.7		0.1	2.9	11.9	
30	0.0	272.2	6.2		0.0	166.2	12	
31	1.0	1.4	6.2		0.6	2.7	10.8	
32	1.3	1.4	5.3		1.6	2.7	10.2	
33	1.1	1.4	6.4		0.0	166.0	12.5	
34	0.0	259.4	6		0.0	173.4	11.3	
35	0.8	1.4	7.1		0.0	174.1	12.3	
36	1.2	1.4	5.8		0.4	2.7	11.3	
37	1.1	1.4	6.1		0.0	2.6	10.9	
38	2.3	1.9	6.2		8.4	3.8	10.8	

HPAL ANALYSIS REPORT

FILE: 29165393

Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: Bercl 2010/143	Name: BONSER BRYAN H
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA: 21 Bldg: 229	Date: 05/22/15	Email: bbonser@lanl.gov
Room: N/A	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA FLAG	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA Flag
39	0.0	251.0	5.7		4.7	3.5	11.9	
40	1.3	1.5	6.2		1.4	3.1	12	
41	0.0	246.4	6.2		0.0	158.5	10.8	
42	0.0	251.3	5.3		5.2	3.2	10.2	


HPAL ANALYSIS REPORT

FILE: 29165397

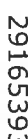
Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: TA3TC3	Name: BONSER BRYAN H
Sample Type: Trit. Smear	Analysis: Liquid Scint.	Phone: -
Location TA:21 Bldg:229	Date: 05/22/15	Email: bbonser@lanl.gov
Room:N/A	Analyst: HILMER ELIZABETH A	
Priority: Routine		
Comments:		
LID (cpm): Alpha=16 Beta=15		

Sample ID	Alpha Activity (dpm)	2* sigma (%)	H-3 Beta Activity (dpm)	2* sigma (%)	Total Beta Activity (dpm)	2* sigma (%)
1	NDA	NDA	NDA	NDA	NDA	NDA
2	NDA	NDA	NDA	NDA	NDA	NDA
3	NDA	NDA	NDA	NDA	NDA	NDA
4	NDA	NDA	NDA	NDA	NDA	NDA
5	NDA	NDA	NDA	NDA	NDA	NDA
6	NDA	NDA	NDA	NDA	NDA	NDA
7	NDA	NDA	NDA	NDA	NDA	NDA
8	NDA	NDA	NDA	NDA	NDA	NDA
9	NDA	NDA	NDA	NDA	NDA	NDA
10	NDA	NDA	NDA	NDA	NDA	NDA
11	NDA	NDA	NDA	NDA	NDA	NDA
12	NDA	NDA	NDA	NDA	NDA	NDA
13	NDA	NDA	NDA	NDA	NDA	NDA

RP-2 HPAAL:RSL SAMPLE SUBMITTAL FORM

Date/Time:	5-20-2015 @ 1500	No. of Samples:	42
TA:	21	Bldg:	229
Submitter:	Bryan Bonser	Room:	N/A
Signature:		Z No:	269854
Contact Name:	L. Priestler	Z No:	259816

<input type="checkbox"/> Priority	<input type="checkbox"/> Emergency
-----------------------------------	------------------------------------

Tracking Number
RP Tracking Number 21-229

 29165393

Sample Type & Analysis (Check Box and provide additional information if needed)							Comments/RPO RWP No:
	NuCon	Air Filter	H-3 Smear (3)	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
Gross α/β	<input checked="" type="checkbox"/>	<input type="checkbox"/>					
LSC			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>		<input type="checkbox"/>				<input type="checkbox"/>
Source Std. (1)							<input type="checkbox"/>

1) Isotope(s): Pu, U
2) Field Screen (dpm): <1000 ☐ alpha ☐ beta ☒ α/β
3) STC Type: None or list type
4) Describe:

Reporting Units:
☒ dpm ☐ μCi ☐ nCi ☐ dpm/m³ ☐ $\mu\text{Ci}/\text{L}$ ☐ pCi/g

N/A

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

Sample ID		Date/Time	SMEARS/LIQUID/OTHER				Description
1	1-42	5-20-2015 @ 1500					TA21-229
2							
3							
4							
5							

CAM FILTER/AIR SAMPLES/CHARCOALS			Flow Rate Units:			<input type="checkbox"/> cfm	<input type="checkbox"/> lpm
Location	Date	Sample On		Flow Rate	Date	Sample Off	
		Time				Time	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

NASAL SMEAR			Type: <input type="checkbox"/> Routine <input type="checkbox"/> Special		Date	Time
Name	Z Number	Group	Respirator			
1			<input type="checkbox"/>			
2			<input type="checkbox"/>			
3			<input type="checkbox"/>			
4			<input type="checkbox"/>			
5			<input type="checkbox"/>			
6			<input type="checkbox"/>			
7			<input type="checkbox"/>			
8			<input type="checkbox"/>			
9			<input type="checkbox"/>			
10			<input type="checkbox"/>			

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-20-2015 @ 1100 No. of Samples: 13
 TA: 21 Bldg: 229 Room: N/A
 Submitter: B. Bonser Z No: 269854
 Signature: [Signature]
 Contact Name: L. Priester Z No: 259816
 Phone/Page/Email: L. Priester 505-500-7373

☐ Priority ☐ Emergency

RP Tracking Number

21-229
113

Sample Type & Analysis (Check Box and provide additional information if needed)

Gross α/β	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 1) Isotope(s): Pu, U, H3
 2) Field Screen (dpm): ☐ alpha ☐ beta ☐ α/β
 3) STC Type: None or list type
 4) Describe:

Reporting Units:
☒ dpm ☐ μCi ☐ nCi ☐ dpm/m³ ☐ $\mu\text{Ci/L}$ ☐ pCi/g

#1 and #11 are blanks.

Comments/RPO RWP No:

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1 1-13	5-20-2015 @ 1100	TA21-229
2		
3		
4		
5		

CAM FILTER/AIR SAMPLES/CHARCOALS

Flow Rate Units: ☐ cfm ☐ ipm

Location	Sample On		Sample Off		Run Time (hr)
	Date	Time	Date	Time	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

NASAL SMEAR

Type: ☐ Routine ☐ Special

	Name	Z Number	Group	Respirator	Date	Time
1				<input type="checkbox"/>		
2				<input type="checkbox"/>		
3				<input type="checkbox"/>		
4				<input type="checkbox"/>		
5				<input type="checkbox"/>		
6				<input type="checkbox"/>		
7				<input type="checkbox"/>		
8				<input type="checkbox"/>		
9				<input type="checkbox"/>		
10				<input type="checkbox"/>		


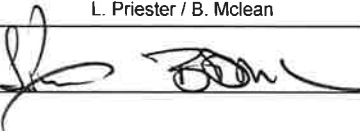
☐ Continuation

Contamination/Radiation Survey Report 2015

COPY

Survey Form Revision 0

RWP NUMBER : N/A **TA-21 Building 387 Characterization Survey**

Survey Number: TA21-2015-00105		Date/Time: 5/20/2015 @ 1600		Item	Location	Alpha			Beta			Tritium	Dose Rate (mrem/hr)																																																
				#	TA-21 Building 387	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma	1 Meter neutron																																											
Survey Type: <input type="checkbox"/> Routine <input type="checkbox"/> Pre-Job RWP <input type="checkbox"/> Post-Job RWP <input type="checkbox"/> RMI <input type="checkbox"/> Drums		Equipment <input type="checkbox"/> Material Release <input type="checkbox"/> Material Receipt <input type="checkbox"/> Vehicle Release <input type="checkbox"/> Vehicle Receipt <input checked="" type="checkbox"/> Characterization Survey		1	Floor - T2	0.0	14.0	14.0	3.4	109.0	112.4	NDA																																																	
				2	Floor	0.0	0.0	0.0	7.0	232.0	239.0	N/A																																																	
				3	Floor	2.5	42.0	44.5	0.0	126.0	126.0	N/A																																																	
				4	East Wall Interior	1.2	14.0	15.2	0.6	0.0	0.6	N/A																																																	
				5	North Wall Interior - T3	0.0	3.0	3.0	4.9	0.0	4.9	NDA																																																	
				6	West Wall Interior	0.0	0.0	0.0	1.4	0.0	1.4	N/A																																																	
				7	West Wall Interior	0.0	0.0	0.0	0.1	0.0	0.1	N/A																																																	
				8	South Wall Interior	1.3	3.0	4.3	1.5	0.0	1.5	N/A		N																																															
Contamination Characterization Survey of TA-21 Building 387 Tritium smear #1 is blank. 'T#' in the 'Location' column indicate the tritium smear # also taken at this sample location. Completed a 10% Scan of all accessible surfaces.		Radiation		9	South Wall Interior	1.2	0.0	1.2	0.0	0.0	0.0	N/A																																																	
				10	East Wall Interior - T4	0.0	8.0	8.0	0.0	0.0	0.0	NDA																																																	
				11	East Wall Interior	0.0	0.0	0.0	0.0	0.0	0.0	N/A																																																	
				12	Ceiling	1.3	3.0	4.3	0.7	0.0	0.7	N/A																																																	
				13	West Wall Interior	0.0	0.0	0.0	0.4	0.0	0.4	N/A																																																	
				14	West Wall Interior	0.0	14.0	14.0	0.0	0.0	0.0	N/A																																																	
				15	Ceiling - T5	0.8	0.0	0.8	0.0	0.0	0.0	NDA																																																	
				16	Ceiling	0.0	14.0	14.0	0.0	0.0	0.0	N/A																																																	
				17	Ceiling	0.0	0.0	0.0	0.0	0.0	0.0	N/A																																																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Instrument</th> <th>P/N #</th> <th>Cal Due</th> <th>Bkgd</th> <th>MDA</th> <th>units</th> </tr> <tr> <td>E600</td> <td>12013</td> <td>9/29/2015</td> <td>19.2</td> <td>47</td> <td>α dpm</td> </tr> <tr> <td>SHP380AB</td> <td>12864</td> <td>4/9/2016</td> <td>1320</td> <td>283</td> <td>β dpm</td> </tr> <tr> <td>N</td> <td></td> <td></td> <td></td> <td></td> <td>α dpm</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>β dpm</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>N/A</td> </tr> <tr> <td></td> <td></td> <td></td> <td>A</td> <td></td> <td>N/A</td> </tr> </table>		Instrument	P/N #	Cal Due	Bkgd	MDA	units	E600	12013	9/29/2015	19.2	47	α dpm	SHP380AB	12864	4/9/2016	1320	283	β dpm	N					α dpm						β dpm						N/A				A		N/A	See attached data sheets.		18	Door	0.0	25.0	25.0	2.5	0.0	2.5	N/A							
		Instrument	P/N #	Cal Due	Bkgd	MDA	units																																																						
		E600	12013	9/29/2015	19.2	47	α dpm																																																						
		SHP380AB	12864	4/9/2016	1320	283	β dpm																																																						
		N					α dpm																																																						
							β dpm																																																						
							N/A																																																						
					A		N/A																																																						
		19	East Wall Exterior	0.0	31.0	31.0	0.2	0.0	0.2	N/A																																																			
		20	East Wall Exterior - T6	0.0	14.0	14.0	5.2	0.0	5.2	NDA																																																			
21	East Wall Exterior	1.0	14.0	15.0	0.0	0.0	0.0	N/A																																																					
22	East Wall Exterior	0.0	14.0	14.0	5.2	0.0	5.2	N/A																																																					
23	North Wall Exterior	1.1	25.0	26.1	2.1	0.0	2.1	N/A																																																					
24	North Wall Exterior	4.1	3.0	7.1	10.8	0.0	10.8	N/A																																																					
25	West Wall Exterior	0.0	42.0	42.0	0.0	0.0	0.0	N/A																																																					
26	West Wall Exterior	1.2	19.0	20.2	0.0	0.0	0.0	N/A																																																					
27	South Wall Exterior	0.0	36.0	36.0	1.0	0.0	1.0	N/A																																																					
RCT Signature:  Supervisor: L. Priester / B. Mclean Signature: 				28	South Wall Exterior	0.0	31.0	31.0	0.0	0.0	0.0	N/A																																																	
				29	Roof- south side - T7	1.2	260.0	261.2	1.0	245.0	246.0	NDA							A																																										
				30	Roof - south side - T8	2.8	290.0	292.8	3.1	177.0	180.1	NDA																																																	
				31	Roof - north side - T9	0.0	383.0	383.0	0.0	204.0	204.0	NDA																																																	
				32	Roof - north side	1.3	338.0	339.3	1.6	296.0	297.6	N/A																																																	
				33	Roof Top - T10	0.0	377.0	377.0	0.0	378.0	378.0	NDA																																																	
				34	Roof Top	4.1	288.0	292.1	0.2	289.0	289.2	N/A																																																	
				35	End of Survey	N/A	N/A	N/A	N/A	N/A	N/A	N/A																																																	
				36	N						A																																																		

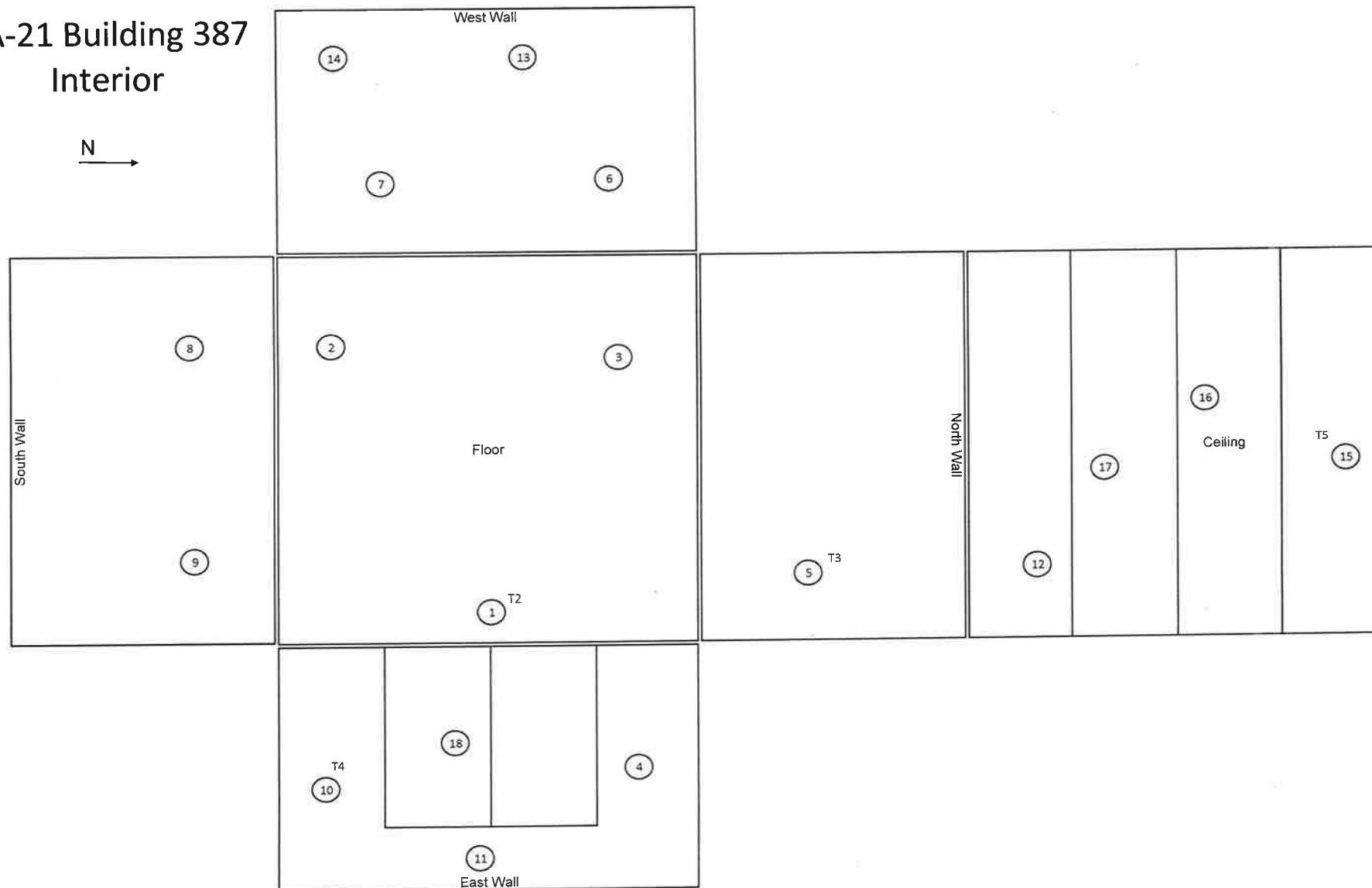
See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00105	Date/Time: 5/20/2015 @ 1600	Comments: TA-21 Building 387 Characterization Survey
Location: TA-21 Building 387	Surveyor: B. Bonser / J. Luna	

TA-21 Building 387 Interior

N
→

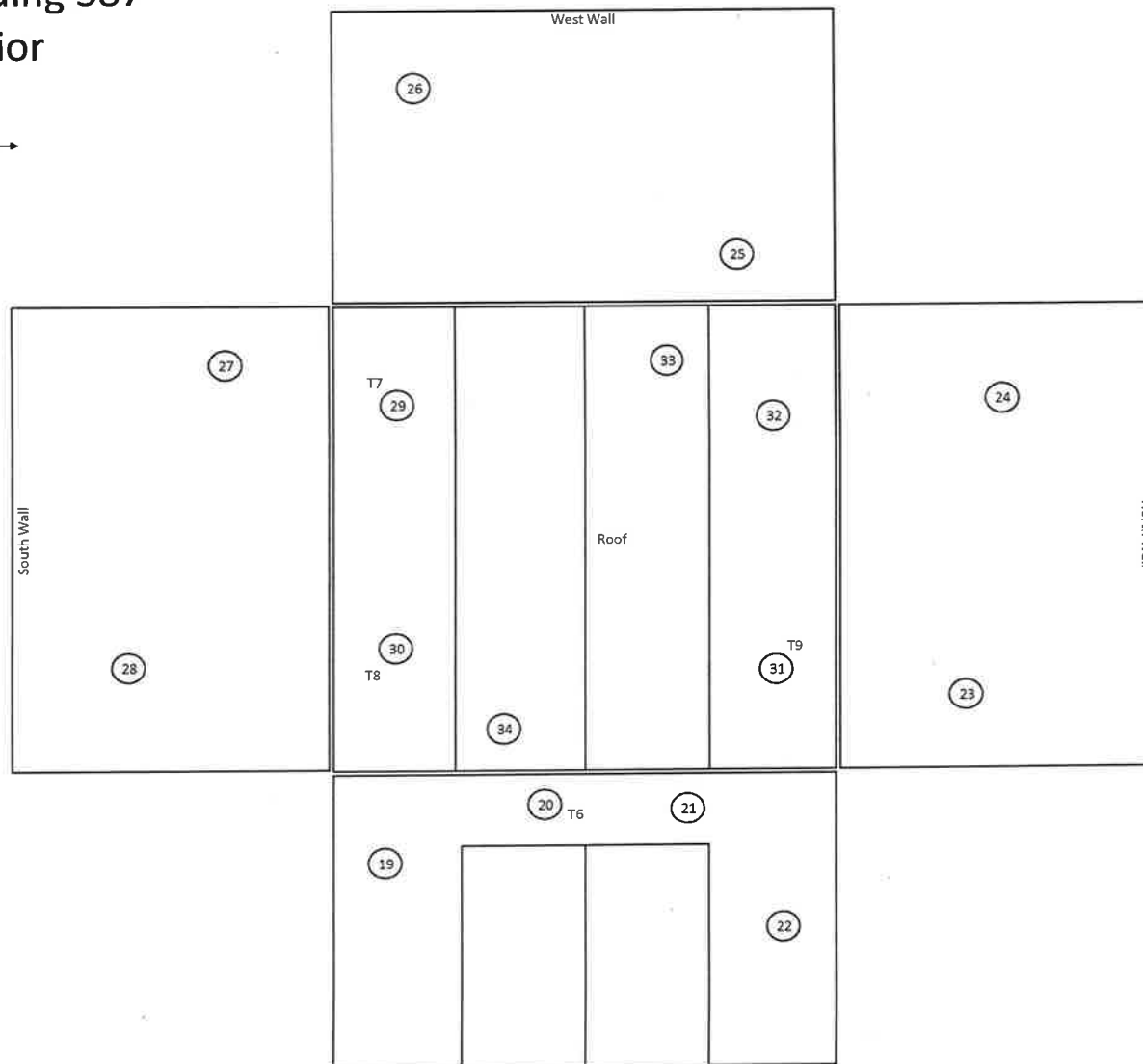


Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00105	Date/Time: 5/20/2015 @ 1600	Comments: TA-21 Building 387 Characterization Survey
Location: TA-21 Building 387	Surveyor: B. Bonser / J. Luna	

TA-21 Building 387

Exterior



HPAL ANALYSIS REPORT

FILE: 29165394

Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: Bertl 2010/143	Name: BONSER BRYAN H
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA:21 Bldg:387	Date: 05/22/15	Email: bbonser@lanl.gov
Room:N/A	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA FLAG	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA FLAG
1	0.0	246.4	6.2		3.4	3.1	10.8	
2	0.0	251.3	5.3		7.0	3.4	10.2	
3	2.5	2.0	6.4		0.0	166.0	12.5	
4	1.2	1.4	6		0.6	2.7	11.3	
5	0.0	259.2	7.1		4.9	3.6	12.3	
6	0.0	253.0	5.8		1.4	2.9	11.2	
7	0.0	258.5	6.1		0.1	2.6	10.9	
8	1.3	1.4	5.3		1.5	2.8	10.8	
9	1.2	1.4	5.7		0.0	163.1	11.9	
10	0.0	272.2	6.2		0.0	166.2	12	
11	0.0	246.4	6.2		0.0	158.5	10.8	
12	1.3	1.4	5.3		0.7	2.5	10.2	
13	0.0	257.8	6.4		0.4	3.1	12.5	
14	0.0	259.4	6		0.0	173.4	11.3	
15	0.8	1.4	7.1		0.0	174.1	12.3	
16	0.0	253.0	5.8		0.0	162.9	11.2	
17	0.0	258.5	6.1		0.0	155.2	10.9	
18	0.0	256.9	5.3		2.5	2.9	10.7	
19	0.0	251.0	5.7		0.2	2.9	11.9	
20	0.0	272.2	6.2		5.2	3.6	12	
21	1.0	1.4	6.2		0.0	158.5	10.8	
22	0.0	251.3	5.3		5.2	3.2	10.2	
23	1.1	1.4	6.4		2.1	3.4	12.5	
24	4.1	2.5	6		10.8	4.2	11.3	
25	0.0	259.2	7.1		0.0	174.1	12.3	
26	1.2	1.4	5.8		0.0	162.9	11.3	
27	0.0	258.5	6.1		1.0	2.7	10.9	
28	0.0	256.9	5.3		0.0	157.9	10.7	
29	1.2	1.4	5.7		1.0	3.0	11.9	
30	2.8	2.1	6.2		3.1	3.4	12	
31	0.0	246.4	6.2		0.0	158.5	10.8	
32	1.3	1.4	5.3		1.6	2.7	10.2	
33	0.0	257.8	6.4		0.0	166.0	12.5	
34	4.1	2.5	6		0.2	2.8	11.3	

HPAL ANALYSIS REPORT

FILE: 29165398

Sample Description	Analysis Information	Contact Information
Login Date: 05/22/15	Instrument: TA3TC3	Name: BONSER BRYAN H
Sample Type: Trit. Smear	Analysis: Liquid Scint.	Phone: -
Location TA:21 Bldg: 387	Date: 05/22/15	Email: bbonser@lanl.gov
Room: N/A	Analyst: GARCIA FRANCISCO L	
Priority: Routine		
Comments:		

LID (cpm) : Alpha=16 Beta=15

Sample ID	Alpha Activity (dpm)	2* sigma (%)	H-3 Beta Activity (dpm)	2* sigma (%)	Total Beta Activity (dpm)	2* sigma (%)
1	NDA	NDA	NDA	NDA	NDA	NDA
2	NDA	NDA	NDA	NDA	NDA	NDA
3	NDA	NDA	NDA	NDA	NDA	NDA
4	NDA	NDA	NDA	NDA	NDA	NDA
5	NDA	NDA	NDA	NDA	NDA	NDA
6	NDA	NDA	NDA	NDA	NDA	NDA
7	NDA	NDA	NDA	NDA	NDA	NDA
8	NDA	NDA	NDA	NDA	NDA	NDA
9	NDA	NDA	NDA	NDA	NDA	NDA
10	NDA	NDA	NDA	NDA	NDA	NDA

Contamination/Radiation Survey Report 2015


COPY

Survey Form Revision 0


RWP NUMBER : N/A **TA-21 Wastewater Treatment Sumps Characterization Survey**

Survey Number:	Date/Time:	Item	Location	Alpha			Beta			Tritium	Dose Rate (mrem/hr)					
				Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma	1 Meter neutron
TA21-2015-00106	5/21/2015 @ 1500	#	TA-21 Wastewater Sumps													
Location:	Surveyor:	1	N. Sump - north wall	0.0	80.0	80.0	0.0	900.0	900.0	N/A						
TA-21 Wastewater Sumps	B. Bonser / J. Luna	2	N. Sump - west wall - T2	0.0	24.0	24.0	0.0	429.0	429.0	NDA						
Survey Type:	Equipment	3	N. Sump - south wal	2.3	47.0	49.3	5.8	469.0	474.8	N/A						
Routine	Material Release	4	N. Sump - east wall	0.0	N/A	0.0	6.1	N/A	6.1	N/A						
Pre-Job RWP	Material Receipt	5	N. Sump - metal pipe	2.5	N/A	2.5	2.9	N/A	2.9	N/A						
Post-Job RWP	Vehicle Release	6	N. Sump - tile pipe - T3	1.2	4.0	5.2	0.0	466.0	466.0	NDA						
RMI	Vehicle Receipt	7	N. Sump - ladder	0.8	N/A	0.8	0.0	N/A	0.0	N/A						
Drums	Characterization Survey	8	N. Sump - metal cover	4.0	53.0	57.0	0.0	0.0	0.0	N/A		N				
Contamination	Radiation	9	N. Sump - metal cover	4.0	83.0	87.0	0.0	0.0	0.0	N/A						
Characterization Survey of		10	N. Sump - monitor box	0.0	30.0	30.0	8.7	0.0	8.7	N/A						
TA-21 Wastewater Sumps		11	S. Sump - concrete wall	0.0	N/A	0.0	0.0	N/A	0.0	N/A						
		12	S. Sump - concrete wall	2.8	N/A	2.8	1.2	N/A	1.2	N/A						
		13	S. Sump - concrete wall	0.0	N/A	0.0	1.7	N/A	1.7	N/A						
		14	S. Sump - concrete wall	0.0	N/A	0.0	0.0	N/A	0.0	N/A						
		15	S. Sump - concrete wall	1.1	N/A	1.1	0.0	N/A	0.0	N/A						
		16	S. Sump - concrete wall	1.2	N/A	1.2	1.5	N/A	1.5	N/A						
		17	S. Sump - concrete wall - T4	2.3	N/A	2.3	0.0	N/A	0.0	NDA						
		18	S. Sump - concrete wall	0.0	N/A	0.0	1.4	N/A	1.4	N/A						
		19	S. Sump - metal trough	6.5	N/A	6.5	33.6	N/A	33.6	N/A						
		20	S. Sump - rusty vent cover - T5	0.0	482.0	482.0	0.0	1328.0	1328.0	NDA						
		21	S. Sump - panel door	0.0	71.0	71.0	0.0	0.0	0.0	N/A						
		22	S. Sump - metal cover	0.0	53.0	53.0	4.3	96.0	100.3	N/A						
		23	S. Sump - concrete top	0.0	47.0	47.0	1.7	67.0	68.7	N/A						
		24	End of Survey	N/A	N/A	N/A	N/A	N/A	N/A	N/A						
		25														
		26														
		27			N											
		28														
		29													A	
		30														
		31														
		32														
		33														
		34						A								
		35														
		36														

See attached data sheets.

RCT Signature: 

Supervisor: L. Priester / B. Mclean

Signature: 

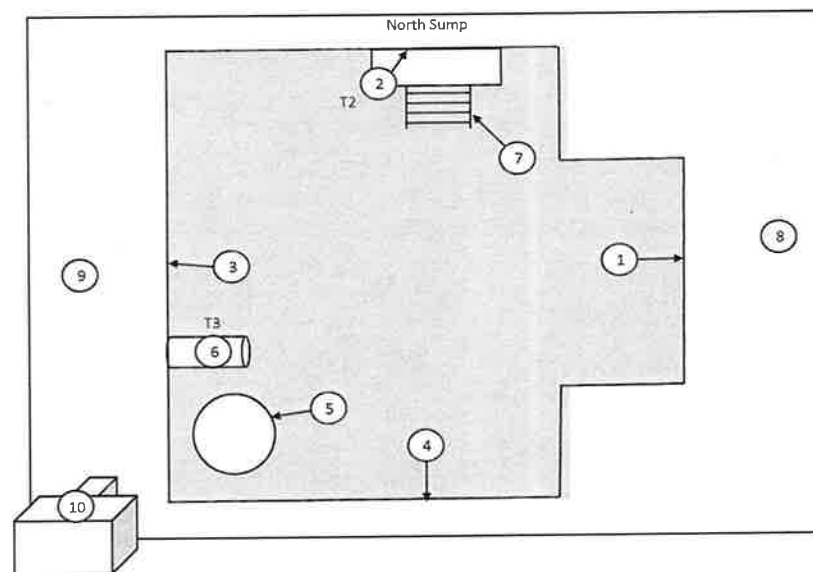
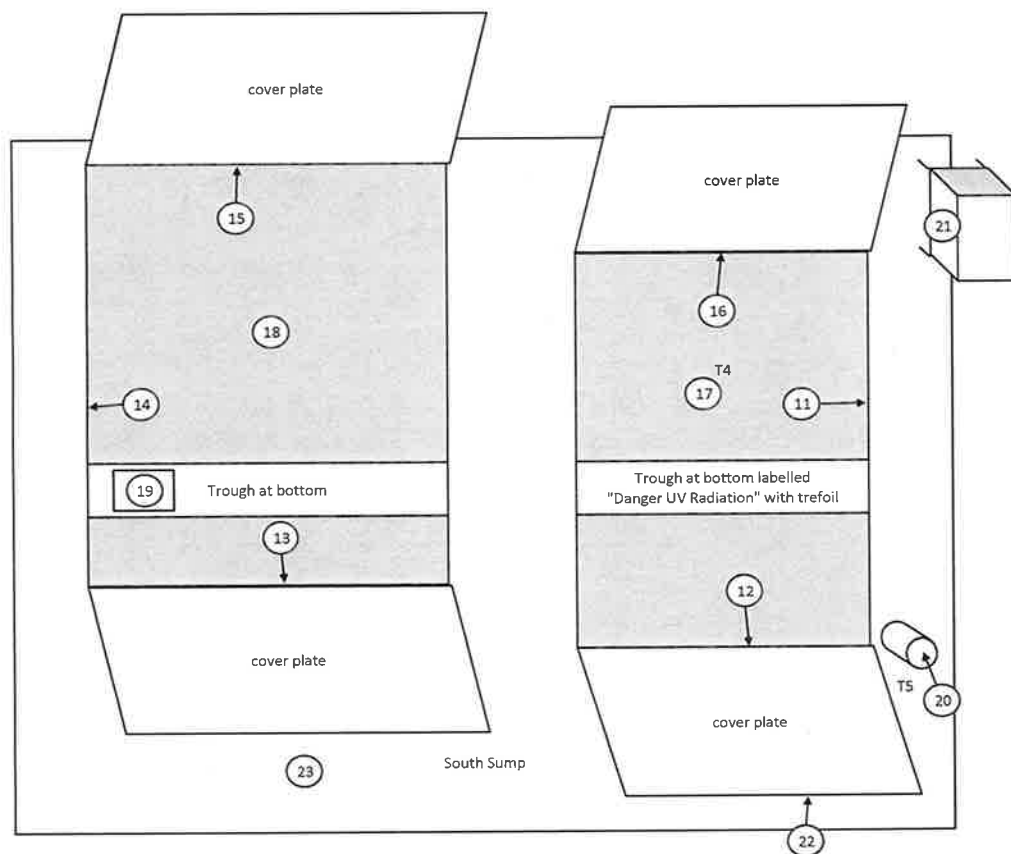
See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00106	Date/Time: 5/21/2015 @ 1500	Comments: TA-21 Wastewater Treatment Sumps Characterization Survey
Location: TA-21 Wastewater Sumps	Surveyor: B. Bonser / J. Luna	

TA-21 Wastewater Sumps

N →



HPAL ANALYSIS REPORT

FILE: 29165400

Sample Description	Analysis Information	Contact Information
LogIn Date: 05/22/15	Instrument: Bertl 2010/143	Name: BONSER BRYAN H
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA:21 Bldg:Wastewa	Date: 05/22/15	Email: bbonser@lanl.gov
Room: Sumps	ter	Analyst: HOMAN VICTORIA M
Priority: Routine	Ttmt	
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA FLAG	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA FLAG
1	0.0	251.0	5.7		0.0	163.1	11.9	
2	0.0	272.2	6.2		0.0	166.2	12	
3	2.3	1.9	6.2		5.8	3.4	10.8	
4	0.0	251.3	5.3		6.1	3.3	10.2	
5	2.5	2.0	6.4		2.9	3.5	12.5	
6	1.2	1.4	6		0.0	173.4	11.3	
7	0.8	1.4	7.1		0.0	174.1	12.3	
8	4.0	2.4	5.8		0.0	162.9	11.3	
9	4.0	2.5	6.1		0.0	155.2	10.9	
10	0.0	256.9	5.3		8.7	3.7	10.7	
11	0.0	251.0	5.7		0.0	163.1	11.9	
12	2.8	2.1	6.2		1.2	3.1	12	
13	0.0	246.4	6.2		1.7	2.8	10.8	
14	0.0	251.3	5.3		0.0	158.2	10.2	
15	1.1	1.4	6.4		0.0	166.0	12.5	
16	1.2	1.4	6		1.5	2.9	11.3	
17	2.3	2.0	7.1		0.0	174.1	12.3	
18	0.0	253.0	5.8		1.4	2.9	11.2	
19	6.5	3.1	6.2	>	33.6	6.1	10.8	
20	0.0	256.9	5.3		0.0	157.9	10.7	
21	0.0	251.0	5.7		0.0	163.1	11.9	
22	0.0	272.2	6.2		4.3	3.5	12	
23	0.0	246.4	6.2		1.7	2.8	10.8	

HPAL ANALYSIS REPORT

FILE: 29164377

Sample Description

Analysis Information

Contact Information

Login Date: 05/29/15

Instrument: TA3TC3

Name: PRIESTER LEROY JR.

Sample Type: Trit. Smear

Analysis: Liquid Scint.

Phone: 500-7373

Location TA:21 Bldg:n/a

Date: 06/01/15

Email: lpriesterjr@lanl.gov

Room: north and

Analyst: CHAVEZ MELISSA F

southsumps

Priority: Routine

Comments:

LID (cpm): Alpha=16 Beta=15

Sample ID	Alpha Activity (dpm)	2* sigma (%)	H-3 Beta Activity (dpm)	2* sigma (%)	Total Beta Activity (dpm)	2* sigma (%)
1	NDA	NDA	NDA	NDA	NDA	NDA
2	NDA	NDA	NDA	NDA	NDA	NDA
3	NDA	NDA	NDA	NDA	NDA	NDA
4	NDA	NDA	NDA	NDA	NDA	NDA
5	NDA	NDA	NDA	NDA	NDA	NDA

HPAL ANALYSIS REPORT

FILE: 15052201

Sample Description	Analysis Information	Contact Information
Login Date: 05/27/15	Instrument: LOAX-2	Name: BONSER BRYAN H
Sample Type: Soil/Solid	Analysis: Isotopic	Phone: -
Location TA:21 Bldg: WW	Date: 05/27/15	Email: bbonser@lanl.gov
Room: Sumps	Trmt: Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Sample ID or Description: 1. Estimated activity. Unable to see Pu in this type of sample.

Isotope Name	Activity (dpm)	2* sigma (dpm)	MDA (dpm)
Am-241	6.94E+01	7.62E+00	4.09E+00

HPAL ANALYSIS REPORT

FILE: 29164378

Sample Description	Analysis Information	Contact Information
LogIn Date: 05/29/15	Instrument: LOAX-1	Name: PRIESTER LEROY JR.
Sample Type: Liquid	Analysis: Isotopic	Phone: 500-7373
Location TA:21 Bldg:n/a	Date: 06/02/15	Email: lpriesterjr@lanl.gov
Room: sump	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Sample ID or Description: 1. Analysis modified. Estimated activity. Could not detect Pu in this type of sample (soil/sludge).

Isotope Name	Activity	2* sigma	MDA
	(dpm)	(dpm)	(dpm)
North Samp Am-241	2.00E+01	2.52E+00	3.49E+00

HPAL ANALYSIS REPORT

FILE: 29164378

Sample Description	Analysis Information		Contact Information
Login Date: 05/29/15	Instrument: LOAX-2	Name: PRIESTER LEROY JR.	
Sample Type: Liquid	Analysis: Isotopic	Phone: 500-7373	Email: lpriesterjr@lanl.gov
Location TA:21 Bldg:n/a	Date: 06/02/15		
Room: sump	Analyst: HOMAN VICTORIA M		
Priority: Routine			
Comments:			
Sample ID or Description: 2. Analysis modified.			

Isotope Name	Activity	2* sigma	MDA
	(dpm)	(dpm)	(dpm)
South Sump NONE-	NDA	NDA	NDA

HPAL ANALYSIS REPORT


FILE: 29164378

Sample Description	Analysis Information	Contact Information
Login Date: 05/29/15	Instrument: LOAX-2	Name: PRIESTER LEROY JR.
Sample Type: Liquid	Analysis: Isotopic	Phone: 500-7373
Location TA:21 Bldg:n/a	Date: 06/02/15	Email: lpriesterjr@lanl.gov
Room: sump	Analyst: HOMAN VICTORIA M	
Priority: Routine		
Comments:		

Sample ID or Description: 3. Analysis modified.

Isotope Name	Activity (dpm)	2* sigma (dpm)	MDA (dpm)
South Sump NONE-	NDA	NDA	NDA

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: <u>5-21-2015 @ 1500</u>	No. of Samples: <u>23</u>	<input type="checkbox"/> Priority	<input type="checkbox"/> Emergency
TA: <u>21</u>	Bldg: <u>Sumps</u>	Room: <u>N/A</u>	
Submitter: <u>Bryan Bonser</u>	Z No: <u>269854</u>	 29165400 TA21 Sumps Nucon	
Signature: _____	L. Priester	Z No: <u>259816</u>	
Contact Name: _____	L. Priester 505-500-7373		
Phone/Page/Email: _____			

Sample Type & Analysis (Check Box and provide additional information if needed)

	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
Gross α/β	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
LSC								
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>						
Leak Test (1)	<input type="checkbox"/>							
Source Std. (1)								

N/A

Comments/RPO RWP No:

- 1) Isotope(s): Pu, U
- 2) Field Screen (dpm): <1000 ☐ alpha ☐ beta ☒ α/β
- 3) STC Type: None or list type _____
- 4) Describe: _____



Reporting Units:
☒ dpm ☐ μCi ☐ nCi ☐ dpm/m³ ☐ $\mu\text{Ci/L}$ ☐ pCi/g

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

Sample ID	Date/Time	Description	SMEARS/LIQUID/OTHER				Flow Rate Units:				
			Location	Date	Sample On Time	Flow Rate	Date	Sample Off Time	Flow Rate	Run Time (hr)	
1	1-10	5-21-2015 @ 1500	TA21 Wastewater Treatment Sump North								
2	11-23	5-21-2015 @ 1500	TA21 Wastewater Treatment Sump South								
3											
4											
5											
6											
7											
8											
9											
10											

NASAL SMEAR		Type: <input type="checkbox"/> Routine <input type="checkbox"/> Special	
Name	Z Number	Group	Time
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: <u>5-29-2015 @ 1000</u>	No. of Samples: <u>5</u>	<input type="checkbox"/> Priority <input type="checkbox"/> Emergency
TA: <u>21</u>	Bldg: <u>Wastewater</u>	Room: <u>Sump</u>
Submitter: <u>B. Bonser</u>	Z No: <u>269854</u>	 RP Tracking Number 29164377
Signature: 		
Contact Name: <u>L. Priestler</u>	Z No: <u>259816</u>	
Phone/Page/Email: <u>L. Priestler 505-500-7373</u>		

Sample Type & Analysis (Check Box and provide additional information if needed)										Comments/RPO RWP No: #1 is a blank.
Gross α/β	<input type="checkbox"/>	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)	
LSC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1) Isotope(s): <u>Pu, U, H3</u> <input type="checkbox"/> alpha <input type="checkbox"/> beta <input type="checkbox"/> α/β										
2) Field Screen (dpm): <u> </u>										
3) STC Type: None or list type <u> </u>										
4) Describe: <u> </u>										

☐ Any Samples with $\geq 20K$ dpm alpha, $\geq 100K$ dpm beta/gamma, or $\geq 400K$ dpm tritium

SMEARS/LIQUID/OTHER									
Sample ID	Date/Time	Description							
1	5-29-2015 @ 1000	Blank							
2	5-29-2015 @ 1000	North Sump West Wall							
3	5-29-2015 @ 1000	North Sump Tile Pipe							
4	5-29-2015 @ 1000	South Sump Floor							
5	5-29-2015 @ 1000	South Sump Vent Pipe Cover							
CAM FILTER/AIR SAMPLES/CHARCOALS									
Location	Date	Sample On Time	Flow Rate	Flow Rate Units:			Run Time (hr)		
				<input type="checkbox"/> cfm	<input type="checkbox"/> lpm	<input type="checkbox"/> ipm			
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
NASAL SMEAR									
Name	Z Number	Type: <input type="checkbox"/> Routine <input type="checkbox"/> Special	Group	Respirator	Date	Time			
1		<input type="checkbox"/>							
2		<input type="checkbox"/>							
3		<input type="checkbox"/>							
4		<input type="checkbox"/>							
5		<input type="checkbox"/>							
6		<input type="checkbox"/>							
7		<input type="checkbox"/>							
8		<input type="checkbox"/>							
9		<input type="checkbox"/>							
10		<input type="checkbox"/>							

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5/22/2015 No. of Samples: 1
 TA: 21 Bldg: WW Trmt Room: Sum 15
 Submitter: Bryan Bonser Z No: 269854
 Signature: [Signature]
 Contact Name: Leroy Priester Z No: _____
 Phone/Page/E-mail: _____

☐ Priority ☐ Emergency

Tracking Number

 15052201

Sample Type & Analysis (Check Box and provide additional information if needed)

Gross α/β	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1) Isotope(s): Pu Am
 2) Field Screen (dpm): _____ ☐ alpha ☐ beta ☐ α/β
 3) STC Type: None or list type _____
 4) Describe: _____

Reporting Units:
☐ dpm ☐ μCi ☐ nCi ☐ dpm/m³ ☐ $\mu\text{Ci/L}$ ☐ pCi/g

Comments/RPO RWP No:

5.22.15 [Signature] 227 sump
 N/A
North Sump

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1	5.21.1506	North Sump Clay
2		
3		
4		
5		

CAM FILTER/AIR SAMPLES/CHARCOALS

Flow Rate Units:

☐ cfm

☐ lpm

Location	Date	Sample On Time	Flow Rate	Date	Sample Off Time	Flow Rate	Run Time (hr)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

NASAL SMEAR

Name

Z Number

Type: ☐ Routine ☐ Special

Group

Respirator

Date

Time

1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 5-29-2015 @ 1000 No. of Samples: 4

TA: 21 Bldg: WW Sumps Room: N/A

Submitter: B. Bopfer Z No: 269854

Signature: [Signature]

Contact Name: L. Priester Z No: 259816

Phone/Page/E-mail: L. Priester 505-500-7373

☐ Priority ☐ Emergency

RP Tracking Number
29164378

Sample Type & Analysis (Check Box and provide additional information if needed)

Gross α/β	NuCon	Air Filter	H-3 Smear (3)	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LSC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Source Std. (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 1) Isotope(s): Pu, Am, U, H3 ☐ alpha ☐ beta ☐ α/β
- 2) Field Screen (dpm):
- 3) STC Type: None or list type
- 4) Describe:

Reporting Units:
☒ dpm ☐ μCi ☐ nCi ☐ dpm/m³ ☐ $\mu\text{Ci/L}$ ☐ pCi/g

☐ Any Samples with $\geq 20\text{K}$ dpm alpha, $\geq 100\text{K}$ dpm beta/gamma, or $\geq 400\text{K}$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1	5-29-2015 @ 1000	N Sump
2	2-3	5 Sump
3	4	Building 227 Sump
4		
5		

CAM FILTER/AIR SAMPLES/CHARCOALS

Flow Rate Units:

☐ cfm ☐ ipm

Location	Date	Sample On Time	Flow Rate	Date	Sample Off Time	Flow Rate	Run Time (hr)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

NASAL SMEAR

Type: ☐ Routine ☐ Special



Name	Z Number	Group	Respirator	Date	Time
1			<input type="checkbox"/>		
2			<input type="checkbox"/>		
3			<input type="checkbox"/>		
4			<input type="checkbox"/>		
5			<input type="checkbox"/>		
6			<input type="checkbox"/>		
7			<input type="checkbox"/>		
8			<input type="checkbox"/>		
9			<input type="checkbox"/>		
10			<input type="checkbox"/>		

☐ Continuation

Contamination/Radiation Survey Report 2015

RWP NUMBER : N/A **TA-21 Building 227 Interior Part 2 Characterization Survey**

Survey Form Revision 0

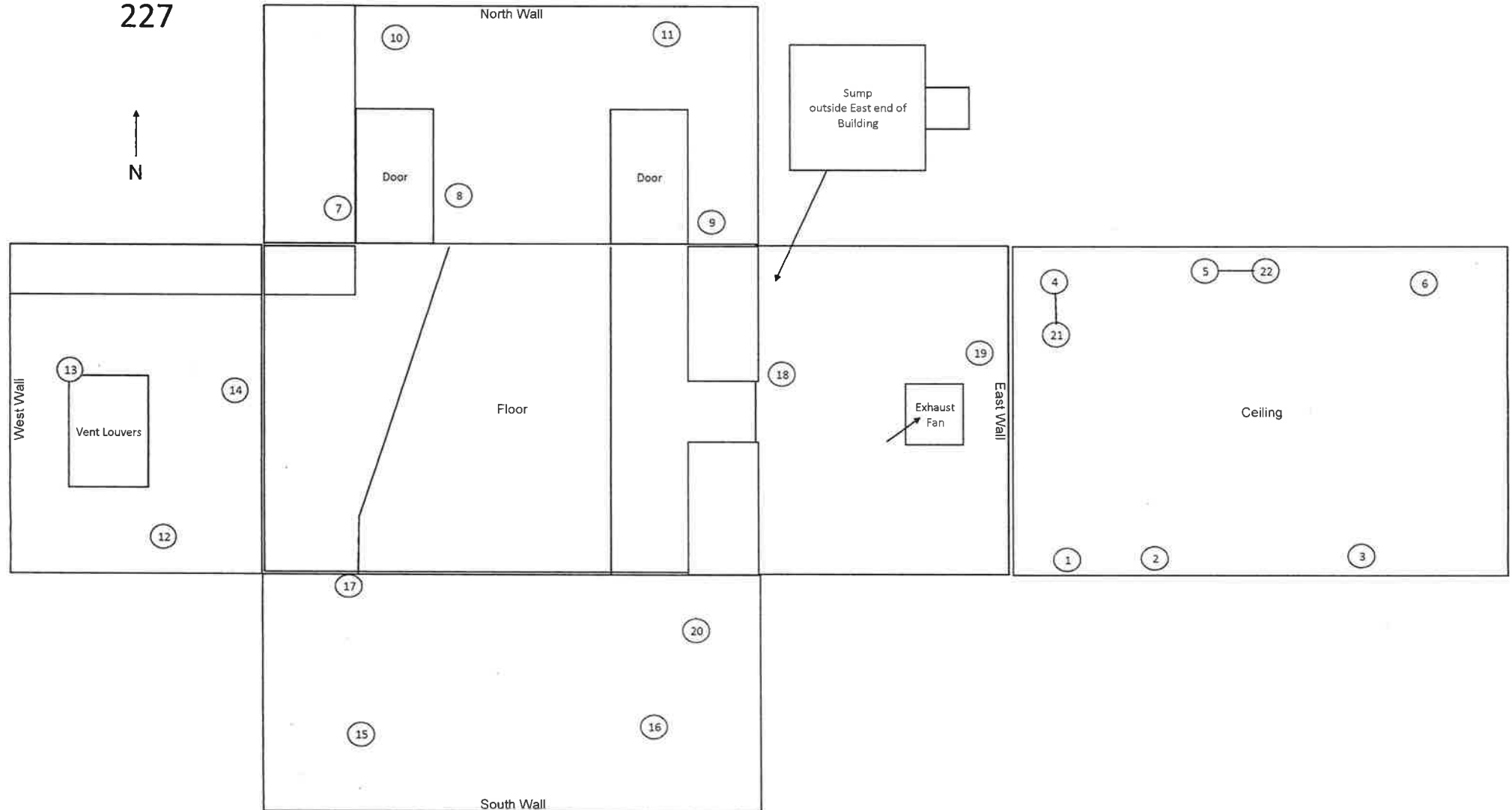
Survey Number:	Date/Time:	Item #	Location	Code	Alpha			Beta			Tritium	Dose Rate (mrem/hr)							
					Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct		Removable (dpm/100cm²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma	1 Meter neutron	
TA21-2015-00302	10/14/2015 @ 14:00		TA-21 Building 227 Interior																
Location: Part -2 TA-21 Building 227	Surveyor: Mims / Winder	1	Insulation	MISC	0.0	0.0	0.0	0.0	0.0	0.0	N/A								
		2	Wood	PW	2.7	0.0	2.7	1.5	86.0	87.5									
Survey Type: Equipment Routine Pre-Job RWP Post-Job RWP RMI Drums	Material Release Material Receipt Vehicle Release Vehicle Receipt Characterization Survey	3	Wood	PW	0.0	0.0	0.0	0.0	0.0	0.0									
		4	Insulation	MISC	0.0	0.0	0.0	2.7	147.0	149.7									
		5	Insulation	MISC	0.8	0.0	0.8	0.0	277.0	277.0									
		6	Insulation	MISC	0.0	0.0	0.0	0.0	0.0	0.0									
		7	Insulation	MISC	0.0	0.0	0.0	0.0	0.0	0.0									
		8	Insulation	MISC	1.3	11.0	12.3	0.6	0.0	0.6									
		9	Insulation	MISC	0.0	15.0	15.0	0.0	0.0	0.0									
Contamination	Radiation	10	Insulation	MISC	0.0	0.0	0.0	3.4	0.0	3.4									
Characterization Survey of TA-21 Building 227 Interior		11	Insulation	MISC	0.0	0.0	0.0	1.7	0.0	1.7									
		12	Insulation	MISC	1.3	7.0	8.3	1.6	0.0	1.6									
		13	Insulation	MISC	0.0	0.0	0.0	0.0	0.0	0.0									
		14	Wood	PW	0.0	1.0	1.0	2.7	0.0	2.7									
		15	Insulation	MISC	0.0	0.0	0.0	0.0	144.0	144.0									
		16	Plexiglass	PL	0.0	6.0	6.0	0.0	0.0	0.0									
		17	Plexiglass	PL	0.0	0.0	0.0	1.0	125.0	126.0									
		18	Insulation	MISC	0.0	7.0	7.0	1.7	128.0	129.7									
Completed a 10% Scan of all accesible surfaces.		19	Insulation	MISC	1.2	0.0	1.2	0.0	63.0	63.0									
Instrument	P/N #	Cal Due	Bkgd	MDA	units	20	Insulation	MISC	1.3	0.0	1.3	9.7	0.0	9.7					
E600	12527	5/13/2016	21.6	63	α dpm	21	Insulation QA - 4	MISC	0.0	16.0	16.0	0.5	105.0	105.5					
SHP380AB	13784	6/5/2016	1349	397	β dpm	22	Insulation QA - 5	MISC	0.0	25.0	25.0	0.1	150.0	150.1					
E600	181951	8/25/2016	20.1	62	α dpm		N/A												
SHP380AB	184322	7/10/2016	853	319	β dpm														
N					N/A														
			A		N/A														
See attached data sheets.																			
RCT Signature: Dennis Mims  Supervisor: L. Priester / B. Mclean Signature: 																			

See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00302	Date/Time: 10/14/2015 @ 14:00	Comments: TA-21 Building 227 Interior Part 2 Characterization Survey
Location: TA-21 Building 227 Interior	Surveyor: Mims / Winder	

TA-21 Building 227



HPAL ANALYSIS REPORT

FILE: 29060673

Sample Description	Analysis Information	Contact Information
Login Date: 10/15/2015 08:57	Instrument: Bert1 2010/143	Name: Ricci Appuglise
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location: TA-21/227	Date: 10/20/2015 13:55	Page/Cell: 303-903-7277
Room: INTERIOR	Analyst: 151086 <i>76</i>	e-mail: -
Priority: Routine		

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID #	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA Flag	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA Flag
1	0.0	246.4	6.2		0.0	158.5	10.8	
2	2.7	2.0	5.3		1.5	2.7	10.2	
3	0.0	257.8	6.4		0.0	166.0	12.5	
4	0.0	259.4	6.0		2.7	3.1	11.3	
5	0.8	1.4	7.1		0.0	174.1	12.3	
6	0.0	253.0	5.8		0.0	162.9	11.2	
7	0.0	258.5	6.1		0.0	155.2	10.9	
8	1.3	1.4	5.3		0.6	2.7	10.8	
9	0.0	251.0	5.7		0.0	163.1	11.9	
10	0.0	272.2	6.2		3.4	3.3	12.0	
11	0.0	246.4	6.2		1.7	2.8	10.8	
12	1.3	1.4	5.3		1.6	2.7	10.2	
13	0.0	257.8	6.4		0.0	166.0	12.5	
14	0.0	259.4	6.0		2.7	3.1	11.3	
15	0.0	259.2	7.1		0.0	174.1	12.3	
16	0.0	253.0	5.8		0.0	162.9	11.2	
17	0.0	258.5	6.1		1.0	2.7	10.9	
18	0.0	256.9	5.3		1.7	2.8	10.7	
19	1.2	1.4	5.7		0.0	163.1	11.9	

HPAL ANALYSIS REPORT

FILE: 29060674

Sample Description	Analysis Information	Contact Information
Login Date: 10/15/15	Instrument: Bertl 2010/143	Name: MIMS DENNIS O
Sample Type: TWSR	Analysis: GrossAB	Phone: -
Location TA:21 Bldg: 227	Date: 10/16/15	Email:
Room: Interior	Analyst: TRUJILLO ISAAC B	
Priority: Routine		
Comments:		

Results not adjusted for energy, attenuation, or yield unless noted. Save Sample

Sample ID	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA FLAG	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA Flag
20	1.3	1.5	6.2		9.7	4.2	12	

HPAL ANALYSIS REPORT

FILE: 29060680

Sample Description

Login Date: 10/19/2015 08:54
Sample Type: TWSR
Location: TA-21/227
Room: interior
Priority: Routine

Analysis Information

Instrument: Bertl 2010/143
Analysis: GrossAB
Date: 10/20/2015 14:12
Analyst: 151086 *76*

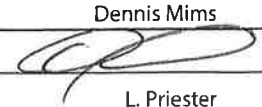
Contact Information

Name: Ricci Appuglise
Phone: -
Page/Cell: 303-903-7277
e-mail: -

Results not adjusted for energy, attenuation, or yield unless noted.

Sample ID #	Alpha Activity (dpm)	2* sigma (dpm)	Alpha MDA (dpm)	Alpha MDA Flag	Beta Activity (dpm)	2* sigma (dpm)	Beta MDA (dpm)	Beta MDA Flag
1	0.0	253.0	5.8		0.5	2.7	11.2	
2	0.0	258.5	6.1		0.1	2.6	10.9	

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: 10-15-2015 / 13:30		No. of Samples: 1		<input type="checkbox"/> Priority	<input type="checkbox"/> Emergency
TA: 21	Bldg: 227	Room: Interior			
Submitter: Dennis Mims		Z No: 304436			
Signature: 					
Contact Name: L. Priestler		Z No: 259816			
Phone/Page/Email: L. Priestler 505-500-7373					

RP-1-D&D Sample Tracking



29060674

Sample Type & Analysis (Check Box and provide additional information if needed)

	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)
Gross α/β	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
LSC			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Leak Test (1)	<input type="checkbox"/>		<input type="checkbox"/>					<input type="checkbox"/>
Source Std. (1)								<input type="checkbox"/>

- 1) Isotope(s): Pu, Am, U
- 2) Field Screen (dpm): ☐ alpha ☐ beta ☒ α/β
- 3) STC Type: None or list type
- 4) Describe:

Comments/RPO RWP No:

Save Sample

Reporting Units:

☒ dpm ☐ μ Ci ☐ nCi ☐ dpm/m³ ☐ μ Ci/L ☐ pCi/g

☐ Any Samples with $\geq 20K$ dpm alpha, $\geq 100K$ dpm beta/gamma, or $\geq 400K$ dpm tritium

SMEARS/LIQUID/OTHER

Sample ID	Date/Time	Description
1	10-15-2015 / 0:30	SMEARS
2		
3		
4		
5		

CAM FILTER/AIR SAMPLES/CHARCOALS

Flow Rate Units:

☐ cfm

☐ lpm



Location	Sample On			Sample Off			Run Time (hr)
	Date	Time	Flow Rate	Date	Time	Flow Rate	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

NASAL SMEAR

Type: ☐ Routine ☐ Special

Name	Z Number	Group	Respirator	Date	Time
1			<input type="checkbox"/>		
2			<input type="checkbox"/>		
3			<input type="checkbox"/>		
4			<input type="checkbox"/>		
5			<input type="checkbox"/>		
6			<input type="checkbox"/>		
7			<input type="checkbox"/>		
8			<input type="checkbox"/>		
9			<input type="checkbox"/>		
10			<input type="checkbox"/>		

RP-2 HPAL:RSL SAMPLE SUBMITTAL FORM

Date/Time: <u>10-14-2015 / 14:00</u>		No. of Samples: <u>19</u>		<input type="checkbox"/> Priority <input type="checkbox"/> Emergency																																																							
TA: <u>21</u>	Bldg: <u>227</u>	Room: <u>Interior</u>		Tracking Number RP-1-D&D Sample Tracking  29060673																																																							
Submitter: <u>Dennis Mims</u>		Z No: <u>304436</u>																																																									
Signature: 		Z No: <u>259816</u>																																																									
Contact Name: <u>L. Priester</u>		Z No: <u>259816</u>																																																									
Phone/Page/Email: <u>L. Priester 505-500-7373</u>																																																											
Sample Type & Analysis (Check Box and provide additional information if needed) <table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <th></th> <th>NuCon</th> <th>Air Filter</th> <th>H-3 Smear (3)</th> <th>Liquid</th> <th>H-3 Air Filter (3)</th> <th>Charcoal</th> <th>Nasal Smear</th> <th>Other (4)</th> </tr> <tr> <td>Gross α/β</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>LSC</td> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> <td><input type="checkbox"/></td> <td></td> </tr> <tr> <td>Isotopic (1,2)</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> <td><input type="checkbox"/></td> <td></td> <td><input type="checkbox"/></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Leak Test (1)</td> <td><input type="checkbox"/></td> <td></td> <td><input type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Source Std. (1)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> </table>					NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)	Gross α/β	<input checked="" type="checkbox"/>	<input type="checkbox"/>							LSC			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	Leak Test (1)	<input type="checkbox"/>		<input type="checkbox"/>					<input type="checkbox"/>	Source Std. (1)								<input type="checkbox"/>	Comments/RPO RWP No: Save Sample	
	NuCon	Air Filter	H-3 Smear (3)	Liquid	H-3 Air Filter (3)	Charcoal	Nasal Smear	Other (4)																																																			
Gross α/β	<input checked="" type="checkbox"/>	<input type="checkbox"/>																																																									
LSC			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>																																																				
Isotopic (1,2)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>																																																			
Leak Test (1)	<input type="checkbox"/>		<input type="checkbox"/>					<input type="checkbox"/>																																																			
Source Std. (1)								<input type="checkbox"/>																																																			
1) Isotope(s): <u>Pu, Am, U</u> 2) Field Screen (dpm): <u> </u> <input type="checkbox"/> alpha <input type="checkbox"/> beta <input checked="" type="checkbox"/> α/β 3) STC Type: None or list type <u> </u> 4) Describe: <u> </u>				Reporting Units: <input checked="" type="checkbox"/> dpm <input type="checkbox"/> μCi <input type="checkbox"/> nCi <input type="checkbox"/> dpm/m3 <input type="checkbox"/> μCi/L <input type="checkbox"/> pCi/g																																																							
<input type="checkbox"/> Any Samples with ≥ 20K dpm alpha, ≥ 100K dpm beta/gamma, or ≥ 400K dpm tritium																																																											
SMEARS/LIQUID/OTHER																																																											
Sample ID	Date/Time	Description																																																									
1	1-19	10-14-2015 / 14:00 smears																																																									
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3																																																											
4																																																											
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CAM FILTER/AIR SAMPLES/CHARCOALS																																																											
		Flow Rate Units: <input type="checkbox"/> cfm <input type="checkbox"/> lpm																																																									
Location	Sample On			Sample Off			Run Time (hr)																																																				
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NASAL SMEAR																																																											
		Type: <input type="checkbox"/> Routine <input type="checkbox"/> Special																																																									
Name	Z Number	Group	Respirator	Date	Time																																																						
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9			<input type="checkbox"/>																																																								
10			<input type="checkbox"/>																																																								

MARSAME Release Report for TA-21 Building 227 below-grade tanks and sumps (January 2016)

Prepared by: _____ Date: _____
Jeff Whicker/Jessica Gillis, ENV-ES, Environmental Health Physics

Approved by: _____ Date: _____
Mark Thacker, PM-8, UI PM FOD and D&D

Summary

ENV-ES finds that the materials associated with the TA-21 Building 227 below-grade tanks and the north and south sumps (see Figure 1) meet the criteria for unrestricted release to the public for recycle or as sanitary/commercial waste. These findings are consistent with the requirements of DOE Order 458.1 "Radiation Protection of the Public and the Environment" and LANL Policy 412 "Environmental Radiation Protection." Sampling and data analysis, as described in this report, were sufficient to meet measurement objectives under the Multi-Agency Radiation Survey and Assessment of Materials and Equipment (MARSAME) manual (2009).

Introduction

The TA-21 sewage treatment Facility (STF) processed sewage for buildings in TA-21. Initial characterization surveys for Buildings 227, 229, 387, and associated sumps were completed in May 2015 and the final MARSAME release survey was completed in October 2015. Based on the results of these surveys, ENV-ES found that the superstructure of Building 227 could be segregated from below grade structures and treated as uncontaminated industrial waste or recycled (concrete and metal). The superstructure was found to be uncontaminated and unconditionally released. Given the higher potential for contamination, an additional survey of the below grade structures, water, and sediment using MARSAME protocol was required prior to releasing these materials. This release report summarizes the findings for release of substructure materials including three tanks in Building 227 and two sumps. For all materials, waste management requirements must be met prior to final waste disposition.



Figure 1 Aerial view of TA 21 Buildings 227, 229, and 387.

MARSAME Survey Description

Data quality objectives for transfer of items into the public domain are described in ENV-ES-TPP-001, R0 (2015). These structures had inadequate process knowledge available to confirm a decision of “non-impacted” under MARSAME guidance. However, due to expected near-background levels of radiological contamination, these structures were classified as Class 3. Characterization surveys were conducted in May 2015, and the data quality and survey completeness were compared to MARSAME requirements. A final release survey plan was developed and approved by DOE in November 2015 (Attachment 1). Additional measurements were made in building 227 substructures and the north and south sumps, and all results are provided in this report (Attachment 2).

To ensure adequacy of survey coverage, ENV-ES uses the statistical software Visual Sample Plan (VSP) (Version 7, 2015). This software incorporates MARSAME requirements to generate a map of planned sampling locations to provide sufficient and representative data for a decision based on the estimated standard deviation of radiological measurements in the survey unit. Fundamental assumptions for this survey plan included the following:

- The data was not assumed to be normally distributed
- The null hypothesis (H_0) in the IFB case is that the radionuclide concentration in the survey unit is IFB. A Type I error (incorrectly rejecting the null hypothesis) means “failing” the survey unit or calling the material contaminated when in fact the material is IFB. Type I error was set at 5%.
- The alternative hypothesis (H_a) in the IFB case is that the radionuclide concentration in the survey unit is elevated above (distinguishable from) background. A Type II error (incorrectly failing to reject the null hypothesis) means “passing” the survey unit or calling the material IFB when in fact it contains elevated radionuclide concentration above background. Type II error was set at 10%.

In addition to surface surveys, residual water and sediment from the 227 sumps were analyzed using gamma spectrometry and liquid scintillation analysis.

Survey Quality Objectives

The number and placement of sampling locations in the characterization survey was compared to MARSAME requirements for final release. The statistical inputs used for this assessment and the sampling plans are presented in Attachment 1. In all cases, the combination of characterization and final release sampling provided an adequate number of data points and spatial distribution to make a statistically-based release decision.

Measurement Quality Objectives

The items included in this report were classified as Class 3 (minimal potential for contamination) consistent with MARSAME. Sampling and analysis protocol for these items was consistent with LANL policy and procedures (LANL P412, TPP 001, RP-1-DP-043). Direct measurements were made using a SHP380AB probe coupled with an Eberline E600 instrument. NUCON smears were used to collect removable samples and were counted using a Berthold 2010/143. This assessment confirms that the measurement quality objectives were met for the disposition of the materials.

Potential disposition pathways for this project included:

- 1) Release of metal and concrete for recycle using a release criterion of < Table 10.2 level in P412. With respect to the DOE moratorium suspension on metal recycling, all metal materials are considered radiologically unencumbered and are available for recycle.

- 2) Release of construction and demolition debris (all other material) for disposal at commercial/municipal landfills using a release criterion of indistinguishable from background.
- 3) Low Level Waste disposal for any material that is not indistinguishable from background.

The objectives of the measurements were to confirm, within the stated statistical confidence limits, that:

- 1) Measurements of total and removable surface radioactivity are below Table 10-2 values in LANL Policy 412 (P412), which are preapproved authorized limits for release for recycle; and/or
- 2) Potential residual radioactive contamination is below background levels (i.e. sample distribution is statistically indistinguishable from background distribution) for release to landfills.

All data met the Measurement Quality Objectives (MQO). Specifically:

- 1) Appropriate instrumentation and techniques were used for the measurements and the expected radionuclides;
- 2) Scanning surveys (10% coverage for MARSAME Class 3) were used to search for hot spots;
- 3) Instruments were calibrated, response checked and background measurements were within expected ranges; and
- 4) The minimum detectable concentrations of the measurements were calculated to be below the surface contamination values in Table 10-2 of P412.

Data Analysis

Naturally occurring radioactive material in building materials is not removable, so the results for *removable* alpha and beta counts were compared to the instrument minimum detectable activity (MDA).

For *direct* alpha and beta counts, results were compared to expected background counts on the surfaces of similar, uncontaminated building materials (as tabulated in Whicker et al 2015). ProUCL Version 4.0 was used to calculate summary statistics and 95% Upper Confidence Limits (UCLs) for the mean of the sample data.

Results

Raw data for the surveys and Laboratory results are provided in Attachment 2. Data summaries for buildings are provided in Tables 1 and 2. Each data value was compared with the appropriate release criteria. For example, recycled concrete was evaluated against Table 10-2 limits in P412. Metal for recycle and building debris slated for disposal at commercial landfills were evaluated against the Indistinguishable from Background (IFB) criteria.

Table 1. Summary statistics for contamination surveys of below-grade tanks in Building 227. Units are dpm/100 cm².

	Removable [dpm/100 cm ²]		Total [dpm/100 cm ²]	
	Alpha	Beta	Alpha	Beta
mean	0.9	1.6	18.9	378.0
STD	1.1	2.4	11.6	84.2
maximum	3.9	6.8	42.0	568.0
MDA/95% UCL Bkg	MDA ~6	MDA ~11	95% UCL 43	1500
Limit	20	1000	100	5000

Conclusions from data for Building 227 below-grade tanks:

- No removable contamination. All results were <MDA
- All direct measurements on concrete were IFB and < Table 10.2 preapproved authorized limits

- Sediment and water analysis showed only naturally occurring radioactive material at regional levels and no detectable tritium.

Conclusion: Building materials from Building 227 substructure sumps are candidates for public release for the defined disposition pathway.

Table 2. Summary statistics for contamination surveys of north and south sumps. Units are dpm/100 cm².

	Removable [dpm/100 cm ²]		Total [dpm/100 cm ²]	
	Alpha	Beta	Alpha	Beta
mean	0.4	0.77	5.8	249.6
STD	0.6	1.0	9.9	176.9
maximum	1.3	3.2	30	551
MDA/95% UCL Bkg	MDA ~6	MDA ~11	95% UCL 43	1500
Limit	20	1000	100	5000

Conclusions from data for north and south sumps:

- No removable contamination. All results were <MDA
- All direct measurements on concrete were IFB and < Table 10.2 preapproved authorized limits

Conclusion: Building materials from north and south sumps are candidates for public release for the defined disposition pathway.

Conclusions

ENV-ES has evaluated the available process knowledge, as well as the survey results provided in Attachments 1 and 2, and found that surveys were adequate to support conclusions of indistinguishable from background for construction/demolition debris and < preapproved authorized limits for recyclable materials. These materials are candidates for unrestricted release under DOE Order 458.1 for the defined disposition pathways.

References

Los Alamos National Laboratory (2014). Eberline E-600 with Various Detectors. LANL Procedure RP-1-DP-043.02.

Los Alamos National Laboratory (2014). Environmental Radiation Protection. LANL Policy 412, R1.

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MARSAME (Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual), (2009). NUREG-1575 (Supp. 1), EPA 402-R-09-001, DOE/HS-004.

VSP Development Team (2015). Visual Sample Plan: A tool for design and analysis of environmental sampling. Version 7.4. Pacific Northwest National Laboratory. Richland, WA. <http://vsp.pnnl.gov>

Whicker, J.J., Gillis, J., McNaughton, M., Ruedig, E. Measurements of alpha and beta radiation from uncontaminated surfaces of common building materials. Los Alamos National Laboratory Report LA-UR-28370; 2015.

Attachments and Appendices

Attachment 1: TA-21 Sewage Treatment Facility D&D MARSAME Final Release Survey Plan Structures: 21-227 Substructure, Sumps

Attachment 2: *Results of surveys for Buildings 227 (superstructure), 229 and 387*

Attachment 1

TA-21 Sewage Treatment Facility D&D MARSAME Final Release Survey Plan Structures: 21-0227 Substructure, Sumps Rev. 0, 11/17/2015

Prepared by: _____ **Date:** _____
Jeff Whicker, ENV-ES, Environmental Health Physics

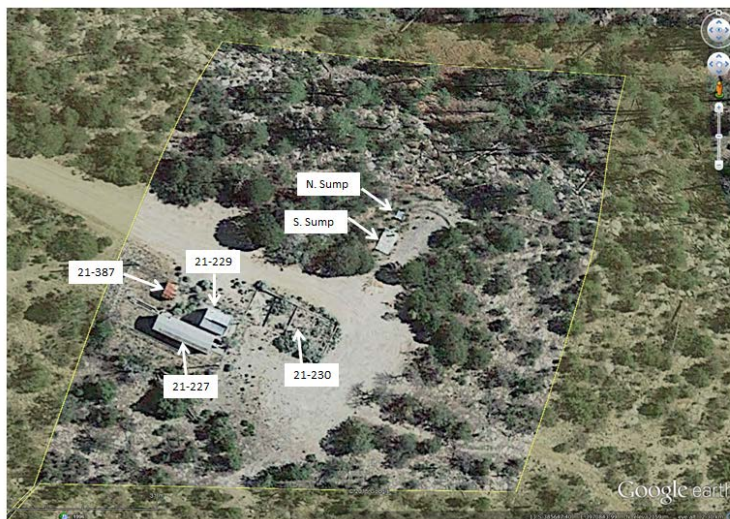
Reviewed by: _____ **Date:** _____
Jessica Gillis, ENV-ES, Environmental Health Physics

Approved by: _____ **Date:** _____
Mark Thacker, PM-8, UI PM FOD and D&D

Summary

The TA-21 Sewage Treatment Facility (STF) processed sewage for buildings in TA-21. The STF is no longer needed and is scheduled for decommissioning and demolition (D&D). Initial characterization surveys for Building 227 and associated sumps were completed in May 2015. The initial focus of the sampling was on the above grade superstructure. The scope of this sampling and analysis plan includes only the tanks/sumps below grade in Building 227 and additional sumps to the north and east. Given the higher potential for contamination, a standalone survey of the below grade structure, water, and sediment was required using MARSAME protocol prior to any releases of building debris to industrial landfills or for recycle. For all materials, waste management requirements need to be met.

A characterization survey of the building including some measurements below grade was completed in May 2015, and the results were used to develop this final MARSAME release survey plan. The characterization survey for below grade materials was not sufficient to meet MARSAME requirements and further surveys are required. The sampling plan for the below grade sumps is outlined in this document.



1. **Purpose and Scope of the MARSAME Final Release Survey**

- 1.1. There are three TA-21 structures (21-0227, 229 and 387) that needed to be characterized to support Decontamination & Demolition (D&D) of these structures. All structures within this plan are considered potentially radiologically impacted based on historical knowledge of operations at TA-21. Since the structures are still standing, the MARSSIM survey approach was utilized to perform characterization surveys of these structures. However, since these structures will eventually be demolished and the waste and any recyclable materials will be sent offsite for disposal, the MARSAME data analysis approach will be utilized to evaluate the waste debris and recyclable material for disposal path decisions, as appropriate. The focus of this plan is on the below-grade concrete walls and floor of the tanks in building 227 and associated sumps.
- 1.2. Per MARSSIM Section 2.4, there are six principal steps in the MARSSIM Radiation Survey and Site Investigation Process:
 - Site Identification
 - Historical Site Assessment (HSA)
 - Scoping Survey
 - Characterization Survey
 - Remedial Action Support Survey
 - Final Status Survey
- 1.3. The MARSSIM HSA information for these structures is contained in Section 2 below. Given the location and function of the STF, we determined these buildings to have potential to contain radiological contamination, and therefore scoping/characterization surveys were completed.
- 1.4. Once the characterization survey was completed, the characterization data was analyzed against the MARSAME guidance. Based on the characterization results, no remedial actions were identified, and these results were used to plan for the final status surveys for release.
- 1.5. Notes and Assumptions:
 - 1.5.1. This plan was prepared in accordance with P412, Environmental Radiation Protection, and developed using P412 Data Quality Objectives.
 - 1.5.2. The nominal release criteria for this D&D project are from Table 10-2 of P412 for surface contamination (see Section 4 of this plan). Further restrictions may be imposed by the Waste Management Coordinator.
 - 1.5.3. Waste disposition pathways for material from D&D projects are as follows:

- 1.5.3.1. Contaminated material that is known or suspected to exceed regulatory limits is to be disposed of as Low Level Waste (LLW).
- 1.5.3.2. Radiologically encumbered metal items (items within areas posted as radiological areas) fall under the metals moratorium and may not be released.
- 1.5.3.3. Unencumbered metals may be released for **reuse** within the DOE complex using the Table 10-2 criteria pending an ALARA evaluation.
- 1.5.3.4. Unencumbered metals may be released to the public for **recycle** using the Table 10-2 criteria pending an ALARA evaluation.
- 1.5.3.5. Concrete may be released for recycle using the Table 10-2 criteria pending an ALARA evaluation.
- 1.5.3.6. Other D&D debris may be released to landfill under NMED regulations using indistinguishable from background criteria.

2. Historical Site Assessment Information

- 2.1. The STF never had radiological operations and was never posted for radiological purposes. However, given that the liquids from TA-21 plutonium and tritium process buildings may have passed through the STF, and the these buildings are in the TA-21 air shed, the buildings associated with the STF are considered to be Class 3 materials, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).
- 2.2. Table A-1 provides summary data for the characterization survey. Assessment of the surface contamination data in the characterization survey for the superstructure at the sewage treatment plant (blds 227, 229 and 387) showed no removable contamination and direct surveys (alpha and beta) consistent with background measurements of similar uncontaminated building materials. There was no detectable tritium in the smear surveys. Preliminary samples of residual liquids and sediment showed detectable levels of americium-241 uranium-234 and tritium that were likely within background ranges. These survey results combined with process knowledge confirm these substructures as Class 3 under MARSAME guidance.

3. Survey Units and Data Analysis

- 3.1. This plan is designed to provide sufficient information for D&D execution and disposition decisions. If surveyors encounter contamination or unexplained increases in standard deviation or measured concentrations during D&D, further mitigation, sampling, and data analysis may be required.
- 3.2. Building and room maps are to be used as rough estimates of the spatial layout of the buildings. Adjustments to the survey units and/or maps may be required based on building specifics for this survey and any additional surveys.

4. Nominal Release Criteria

- 4.1. Table 1. Nominal release criteria for surface contamination.

Table 1: Values from P412 Section 1021 Table 2-2 (value units are disintegrations per minute (dpm) per 100 cm ²)		
U-natural, U-235, U-238 and associated decay products (Removable)	1,000	dpm/100cm ²
U-natural, U-235, U-238 and associated decay products (Total)	5,000	dpm/100cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 (Removable)	20	dpm/100cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 (Total)	100	dpm/100cm ²
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 (Removable)	200	dpm/100cm ²
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 (Total)	1,000	dpm/100cm ²
β/γ emitters (Removable)	1,000	dpm/100cm ²
β/γ emitters (Total)	5,000	dpm/100cm ²
Tritium and Special Tritium Compounds	10,000	dpm/100cm ²

- 4.3 Based on process knowledge of facility operations, sampling and data analysis for volumetric contamination is required for the sediment, water, and concrete in the substructure of the buildings. If evidence for volumetric contamination is encountered, volumetrically contaminated items may be released using a criterion of statistically indistinguishable from background, as compared to instrument background or measured background radioactivity in clean materials for NORM radionuclides.

5. General Survey Instructions

- 5.1 Verify characterization activities are on the applicable Plan-of-the-Day, as appropriate.
- 5.2 Perform a Pre-Evaluation Brief and/or Job Task Brief in accordance with P300.
- 5.3 Verify personnel have appropriate training for the applicable tasks they will be performing.
- 5.4 Comply with applicable Radiological Work Permit (RWP) requirements, if RWP is required.
- 5.5 Follow applicable Integrated Work Documents [IWD(s)], as necessary.

6. Survey-Specific Instructions

- 6.1 A general overview of the final survey plan requirements is provided in Table 2, and detailed locations for survey are for each of the buildings are provide in Figure A-1, with additional details in Appendix 1.

- 6.2 Follow P121, RP-1-DP-37 “Surveying for Fixed and Removable Contamination”, and other applicable characterization and sampling procedures. Document all survey results on the appropriate survey form(s) and the survey map(s). All direct and removable measurement results are to be reported as dpm/100cm². Do not use no detectable activity or “NDA.”
- 6.3 The number of direct and removable measurements is specified in the following Survey Unit and Survey Requirement tables for each survey unit. Survey point locations (both direct counts and smears) will be a combination of “Uniformly Distributed” and “Biased” locations determined by the Surveyors. Uniformly distributed points shall be spread across all survey unit surfaces in a uniform, even, systematic pattern (similar to a grid pattern). Survey point locations may be changed based on accessibility issues via consultation with Jeff Whicker or Jessica Gillis.
- 6.4 Collect and record direct measurement instrument background readings periodically during surveys (approximately 5 background measurements per survey unit). Identify and document background measurements on the survey form and maps with the survey unit number, “-BKG,” and sequential background number (e.g. 1-BKG1, 1-BKG2, etc.). Collect background measurements on direct reading probes by pointing the probe into the air and away from any nearby surfaces.
- 6.5 Required Surveys include:
- 6.5.1 Surface scan surveys using a SHP380AB (α / β) detector, listening for increased count rate areas.
- 6.5.2 60 second scalar direct surveys using an SHP380AB (α / β).
- 6.5.3 NUCON smears (counted for α and β/γ).
- 6.5.4 Volume contamination surveys: gamma spectral analysis of sediment and tritium measurements of liquids collected in the sumps. Depending on these results, volume sampling of interior concrete wall in the settling tank (first tank in the line) might be required.
- 6.6 QA survey measurements are required for MARSAME Final Status Surveys. Duplicate measurements should be made at approximately 10 percent of the surveyed locations.
- 6.7 Scan percentages are specified in the following Survey Unit and Survey Requirement tables for each survey unit. For any areas of noticeably elevated count rate, a biased measurement (direct and smear) shall be collected and documented. When biased surveying is required, scan surveys should be used to decide locations of biased survey points, or the biased locations can be selected based on process knowledge. Denote biased surveys sequentially after the last systematic survey location. Biased measurement locations may include: high traffic areas such as room entrances, HVAC intakes and exhaust ducts, storage areas, areas of frequent personnel contact such as doors and door frames, horizontal surfaces such as lab counter tops and shelves, sinks,

the openings to sink and floor drains; the tops of lights, beams, crane rails, structural beams, etc.

- 6.8 On the survey forms, denote surface material (e.g., “concrete,” “metal,” etc.), as well as locations of biased surveys.
- 6.9 Use provided survey maps, or create scaled maps as necessary, to document the survey locations and results.
- 6.10 Smear survey results are to be reported in the form consistent with the results from HPAL. HPAL should be requested to report results as dpm/100cm² (not NDA). In consultation with HPAL, isotopic analysis can be performed on smears with high gross alpha/beta results if the radioisotope (or mixture) is unknown. Save all smears for possible future HPAL analysis.
- 6.11 Collect and maintain all characterization paperwork. Number each page of the survey unit packages using the format “XX of XX”. Survey Unit packages should include survey forms, maps, HPAL smear results, and HPAL isotopic analysis (if required). Provide all completed paperwork to Jeff Whicker, Jessica Gillis, or Mark Thacker.

7. Surface Labeling Requirements

- 7.1 Denote survey unit location numbers on structure surfaces where measurements are obtained. Mark locations on using the survey unit designation plus the next sequential survey point location number. For example, for survey unit 21-5-2, location survey point number 5, mark the structure surface with the number 21-5-2-5.
- 7.2 The direct reading probe outline shall be drawn on the surface with a marker and a template to identify the exact surveyed location in the event a re-survey is necessary.
- 7.3 Denote on the survey map where the scan, direct, and smear surveys were performed. Scan area may be approximated by a highlighted/circled area in survey units that require less than 100% scanning. Record the general scan findings on the survey forms and/or maps.

8.0 Special Support and Safety Requirements

- 8.1 Walls, basement floors, sump bottoms, and ceilings/roofs require access via ladders, scaffolding, man-lifts, etc.
- 8.2 Survey technicians shall be trained for elevated work.
- 8.3 Pest control will likely be required in and around all structures.

9.0 Appendices

Appendix 1. Specific Sampling Locations for Final Status Survey Building 227-Substructure Tanks and External Sumps

Appendix 2. Statistical Summary Report for Determining Sampling Locations

Table 2. Summary of Final Status Survey for Substructure of Building 227, and associated sumps at the TA-21 Sewage Treatment Facility

Class 3 Areas

These survey units have the potential to contain, or have ever contained, some residual radioactivity greater than natural or fallout background levels. Individual measurements may exceed background levels, but are not expected to exceed the action levels.

Historical measurements and air sampling data indicate that contamination is unlikely. However, given that the liquids from TA-21 plutonium and tritium process buildings passed through the STP, and the these buildings are in the TA-21 air shed, the STF is considered to be class 3 area, as defined under MARSAME (e.g., small potential for contamination, but at levels near background).

Survey Area	Survey Unit	Description	Scan %	Direct Survey	Smears	Media	Class Justification
21-0227	Interior walls and floor	Sump walls and floor of settling, aeration and digester tanks	≤10%	~20 ~2 QA ~2 volume samples	~20 ~2 QA	Surfaces and volume	Characterization surveys from the walls and roof confirmed very low potential for contamination.
21-North and South Sumps	Interior floors, wall and ceiling	North and South sumps external to Bld 227	≤10%	~20 ~2 QA ~2 volume samples	20 ~2 QA	Surfaces and volume	Characterization surveys from the interior walls and roof confirmed very low potential for contamination.
Interior Spaces Total			Surface	~40 ~4 QA	~40 ~4QA		
			Volume	~4 Volume			
Class 3 Total				~40 ~4 QA ~4 Volume	~40 ~4QA		

Appendix 1. Specific Sampling Locations for Final Status Survey

Building 227-Substructure Tanks and External Sumps

Parameters used to determine the number and placement of sample locations for direct and smear surveys for the substructure walls, floor, and ceilings in the north and south sumps are provided in Table A-1. The walls and floors were combined and treated as single decision areas for the settling, aeration, and digester tanks. The north and south sumps were combined and treated as a single decision area. Appendix 1 reports the details of the statistical analysis and the results. Locations can be adjusted in the field, if necessary, for safety or other practical matters. If sampling of floor in tanks is problematic due to standing water, then survey the floor after removal of the flooring and surfaces dry. If not feasible, sampling walls just above the waterline is acceptable. The selected sampling pattern was a triangular grid with a random start location.

Table A-1. Visual Sampling Plan (VSP) software inputs from the building 227 interior characterization survey:

Parameter	DCGL [dpm/100cm²]- Authorized Level	Expected [dpm/100cm²] from characterization	Standard Dev [dpm/100cm²] from characterization
Removable Alpha	20	0.5	0.7
Direct Alpha	100	25	20
Removable Beta	1000	0.3	1.8
Direct Beta	5000	72	126
DCGL = Derived Concentration Guideline Level from MARSAME. This value is used as the limit to which measurements are compared. In this survey, DCGL values represent the preapproved surface contamination limits in P412.			

Maps of VSP-selected Sampling Locations

Figure A-1. Sampling locations with all three sumps combined into single decision area. Settling tank is on far right, aeration tank below middle, and digester tank is far left.

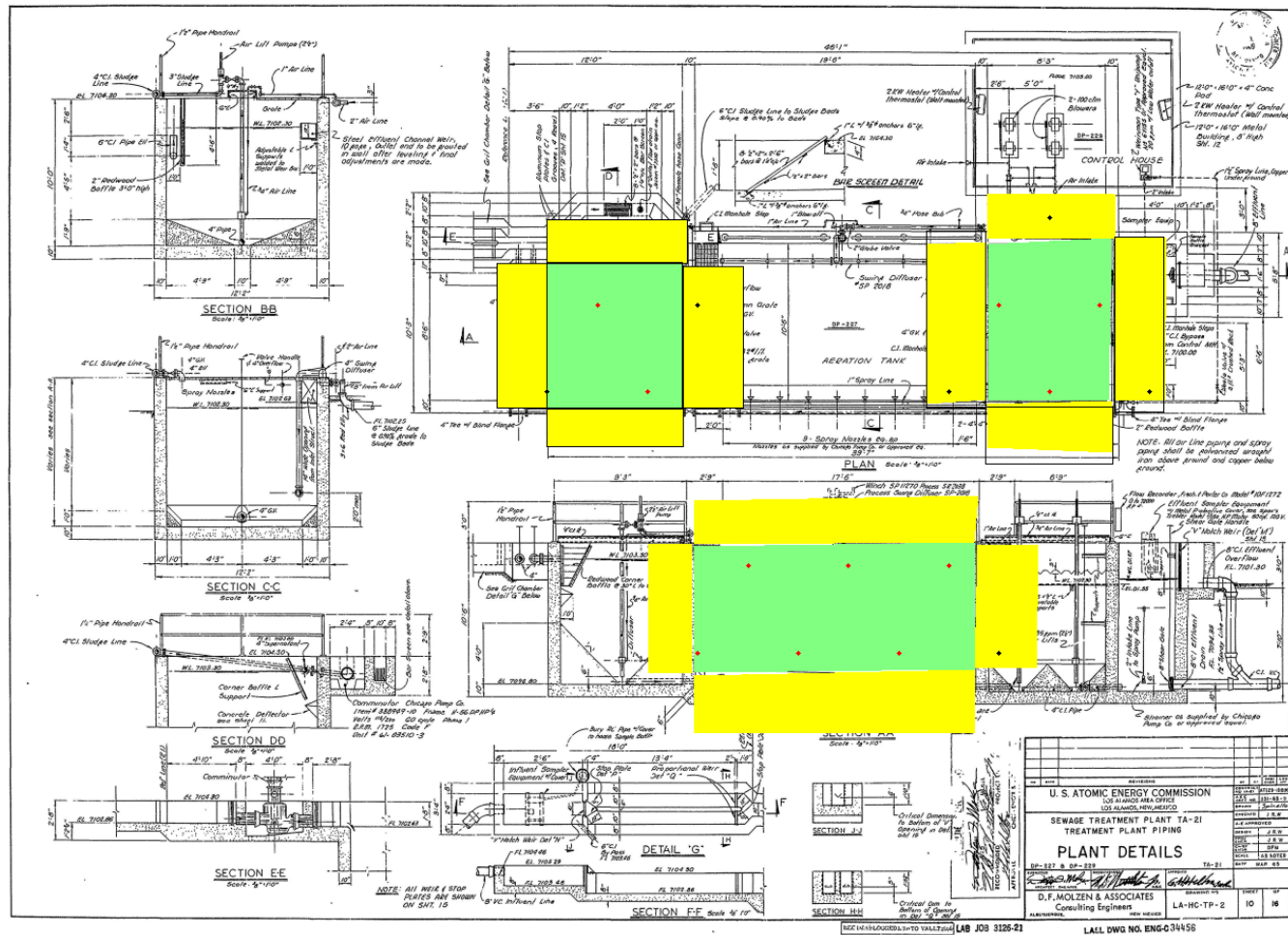


Figure A-2. Sampling locations for south sump.

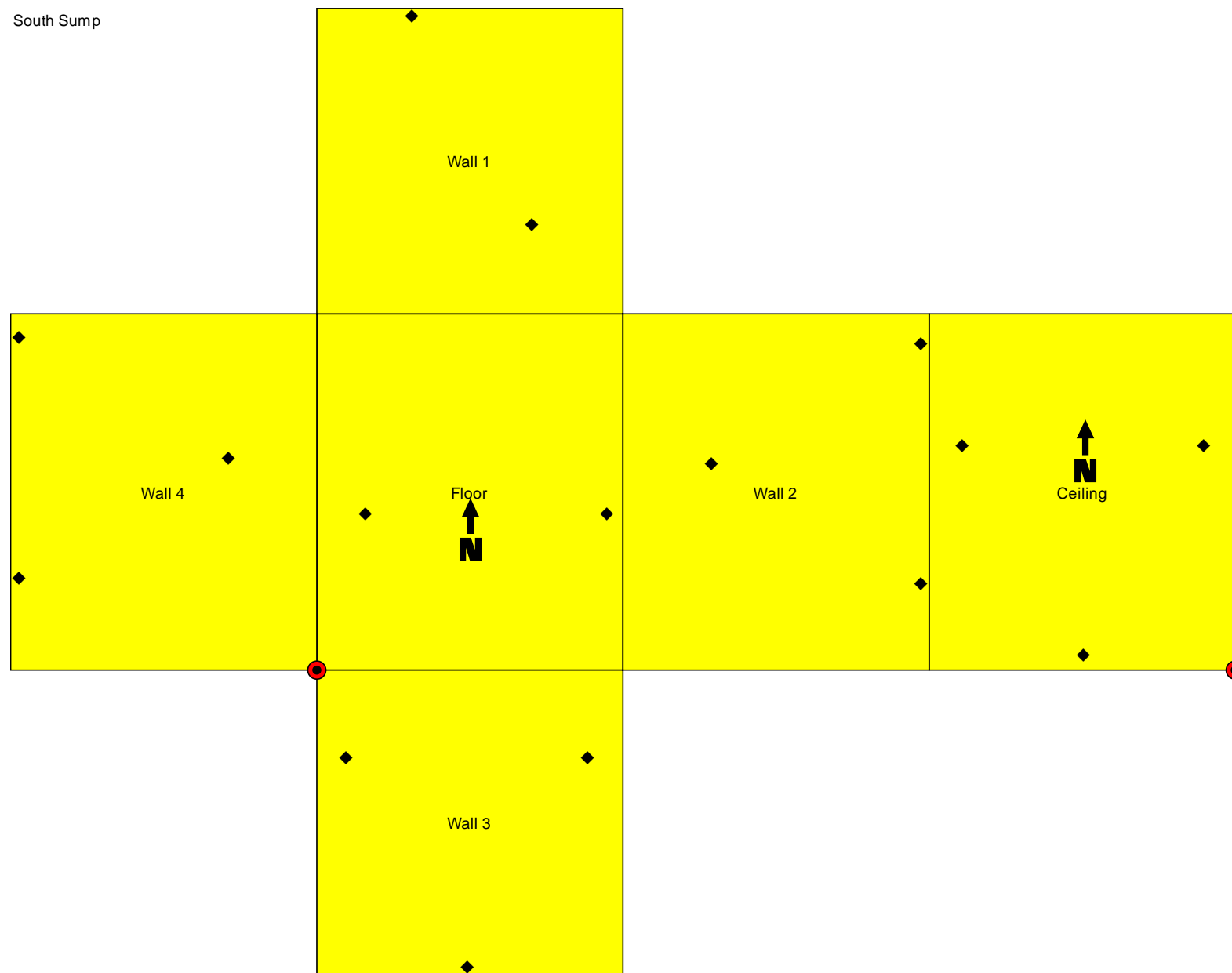
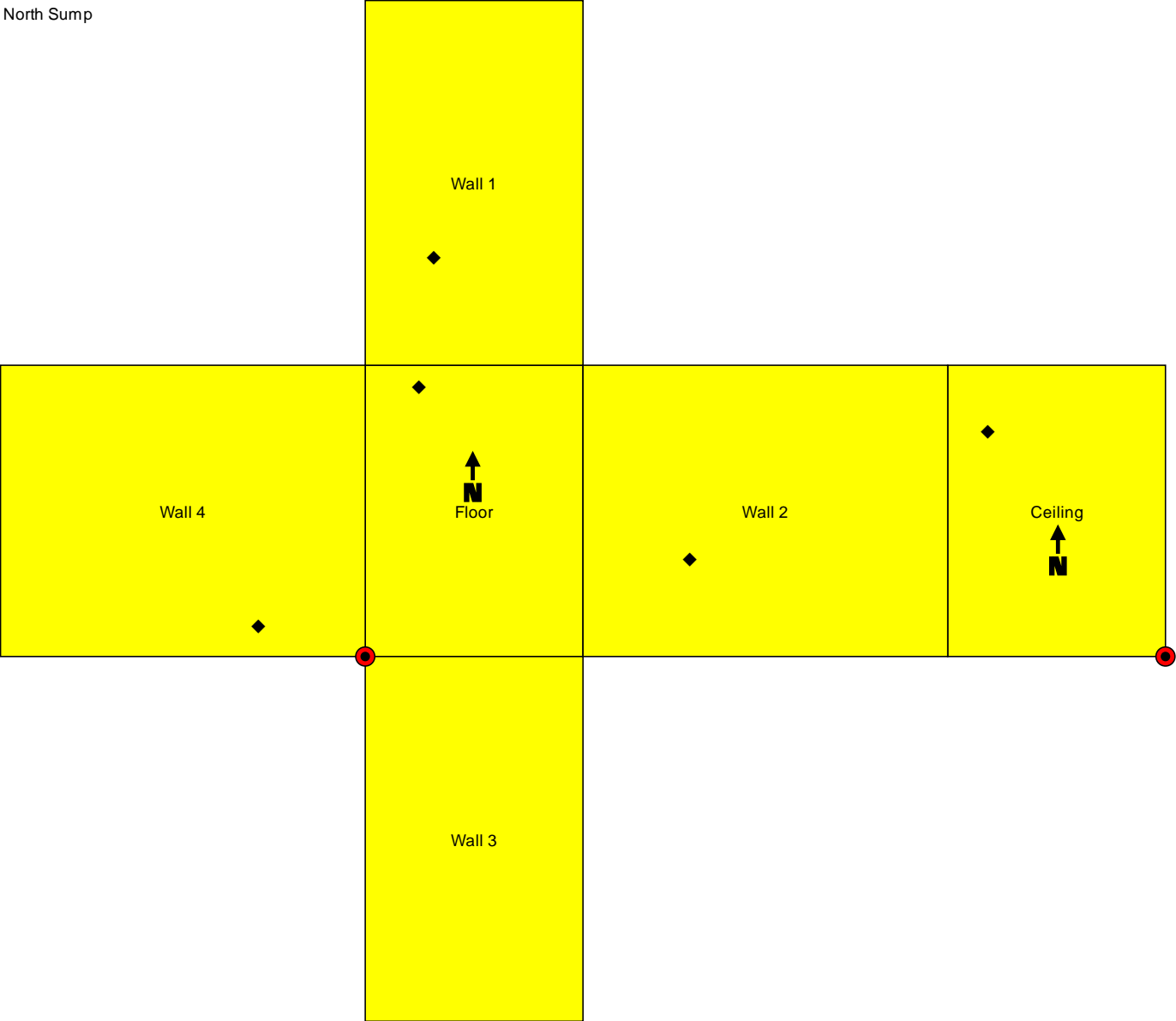


Figure A-3. Sampling locations for north sump.



Appendix 2: Statistical Summary Report for Determining Sampling Locations

Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site is less than the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Grid pattern	Triangular

Primary Sampling Objective

The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is less than the threshold. The alternative hypothesis is that the median(mean) value is equal to or exceeds the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach

A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs

The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently larger than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(\text{Sign}P - 0.5)^2}$$

where

$$\text{Sign}P = \Phi\left(\frac{\Delta}{S_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty, z)$ (see PNNL-13450 for details),

n is the number of samples,

S_{total} is the estimated standard deviation of the measured values including analytical error,

Δ is the width of the gray region,

α is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,

β is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,

$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,

$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n . VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n ^a	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ ^b	$Z_{1-\beta}$ ^c
alpha-Total Concrete	15	20 dpm/100 cm2	40 dpm/100 cm2	0.05	0.05	1.64485	1.64485
beta- Total Concrete	15	126 dpm/100 cm2	252 dpm/100 cm2	0.05	0.05	1.64485	1.64485
Alpha- Removable	15	1 dpm/100 cm2	2 dpm/100 cm2	0.05	0.05	1.64485	1.64485
Beta- Removable	15	2 dpm/100 cm2	4 dpm/100 cm2	0.05	0.05	1.64485	1.64485

^a The final number of samples has been increased by the MARSSIM Overage of 20%.

^b This value is automatically calculated by VSP based upon the user defined value of α .

^c This value is automatically calculated by VSP based upon the user defined value of β .

Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2 , is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, upper bound of gray region (% of action level), beta (%), probability of mistakenly concluding that $\mu <$ action level and alpha (%), probability of mistakenly concluding that $\mu >$ action level. The following table shows the results of this analysis.

Number of Samples							
AL=1000		$\alpha=5$		$\alpha=10$		$\alpha=15$	
		s=4	s=2	s=4	s=2	s=4	s=2
UBGR=110	$\beta=5$	15	14	11	11	10	10
	$\beta=10$	11	11	9	9	8	8
	$\beta=15$	10	10	8	8	6	6
UBGR=120	$\beta=5$	14	14	11	11	10	10

	$\beta = 10$	11	11	9	9	8	8
	$\beta = 15$	10	10	8	8	6	6
UBGR=130	$\beta = 5$	14	14	11	11	10	10
	$\beta = 10$	11	11	9	9	8	8
	$\beta = 15$	10	10	8	8	6	6

s = Standard Deviation

UBGR = Upper Bound of Gray Region (% of Action Level)

β = Beta (%), Probability of mistakenly concluding that $\mu < \text{action level}$

α = Alpha (%), Probability of mistakenly concluding that $\mu > \text{action level}$

AL = Action Level (Threshold)

Recommended Data Analysis Activities

Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

This report was automatically produced* by Visual Sample Plan (VSP) software version 7.2.

This design was last modified 10/30/2015 11:25:43 AM.

Software and documentation available at <http://vsp.pnnl.gov>

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* - The report contents may have been modified or reformatted by end-user of software.

Attachment 2

Contamination/Radiation Survey Report 2015

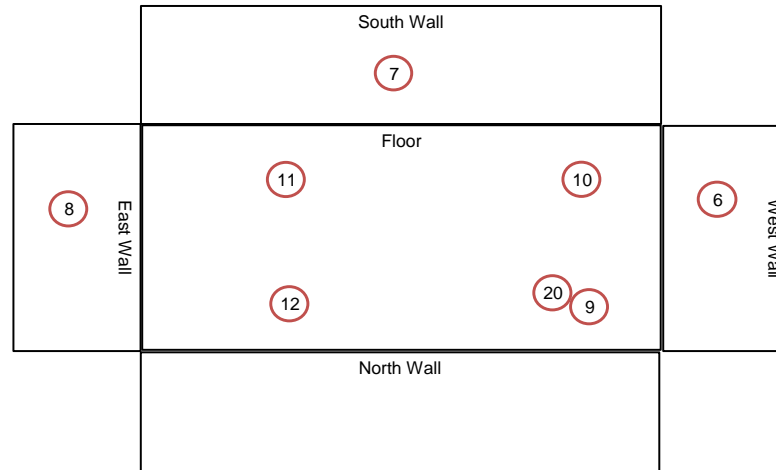
RWP NUMBER : N/A				Characterization of TA-21-227 Sump Tanks Survey Report										Survey Form Revision 0			
Survey Number:	Date/Time:	Item	Location	Alpha			Beta			Tritium	Dose Rate (mrem/hr)						
TA21-2015-00332	11/30/15 @ 11:00	#	BLDG 227 Sumps	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma	1 Meter neutron	
Location: TA-21-227	Surveyor: G. Winder	1	Digester West Wall	0	27	27	0.8	387	387.8	N/A							
		2	South Wall	0	38	38	0	408	408								
Survey Type: <input type="checkbox"/> Routine <input type="checkbox"/> Pre-Job RWP <input type="checkbox"/> Post-Job RWP <input type="checkbox"/> RMI <input type="checkbox"/> Drums <input type="checkbox"/> Equipment <input type="checkbox"/> Material Release <input type="checkbox"/> Material Receipt <input type="checkbox"/> Vehicle Release <input type="checkbox"/> Vehicle Receipt <input checked="" type="checkbox"/> Characterization	<input checked="" type="checkbox"/> Contamination <input type="checkbox"/> Radiation	3	East Wall	1.1	17	18.1	0	321	321								
		4	Floor	1.2	10	22	0	410	410								
		5	Floor	0.8	10	10.8	0	550	550								
		6	Aeration West Wall	0	11	11	1.4	380	381.4								
		7	South Wall	0	38	38	0	359	359								
		8	East Wall	1.3	27	28.3	0	375	375			N					
		9	Floor	0	10	10	0	298	298								
		10	Floor	2.8	10	12.8	6.8	302	308.8								
		11	Floor	0	5	5	5.2	568	573.2								
		12	Floor	1.3	26	27.3	1.6	512	513.6								
		13	Settling West Wall	3.9	21	24.9	0	337	337								
		14	East Wall	0	5	5	3.6	452	455.3								
		15	North Wall	0	15	15	0	340	340								
		16	Floor	0	42	42	1.4	325	326.4								
		17	Floor	1.1	31	32.1	0	280	280								
		18	Floor	2.7	10	12.7	5.8	350	355.8								
		19	QA for #3	0	10	10	0	295	295								
		20	QA for #9	1.3	15	16.3	6	310	316								
Instrument P/N # Cal Due Bkgd MDA units E600 12503 4/9/2016 11.3 50 α dpm SHP 380 AB 14822 5/28/2016 1666 439 βdpm E600 N SHP 380 AB N 3030 3030 A See attached data sheet for other instrument information.		21															
		22															
		23															
		24															
		25															
		26															
RCT Signature: _____ Supervisor: Leroy Priester / Bret McLean Signature: _____		27															
		28															
		29															
		30															
		31															
		32							A								
		33															
		34															
		35															
		36															

See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

Survey Number: TA21-2015-00332	Date/Time: 11/30/15 @ 11:00	Comments: Characterization of TA-21-227 Sump Tanks Survey Report
Location: TA-21-227	Surveyor: G. Winder	

TA-21-227 Sump Tanks



Aeration Tank

Settling Tank



Digester Tank



Contamination/Radiation Survey Report 2015

RWP NUMBER : N/A TA-21 Sewage Treatment Plant North/South Sumps

Survey Form Revision 0

Survey Number:		Date/Time:		Item #	Location	Alpha			Beta			Tritium	Dose Rate (mrem/hr)					
TA21-2015-00355		12-17-2015 / 09:00				Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct	Removable (dpm/100cm²)	Direct (dpm/100cm²)	Total (dpm/100cm²) Removable + Direct		Removable (dpm/100cm²)	Contact beta/gamma	Contact neutron	30 cm beta/gamma	30 cm neutron	1 Meter beta/gamma
Location: TA-21-STP North / South Sumps		Surveyor: G. Winder		1	Ceiling	0.0	0.0	0.0	0.0	0.0	0.0	N/A						
				2	Ceiling	1.3	0.0	1.3	0.7	0.0	0.7							
Survey Type: <div style="display: flex; justify-content: space-between;"> <div> Routine Pre-Job RWP Post-Job RWP RMI Drums </div> <div> Equipment Material Release Material Receipt Vehicle Release Vehicle Receipt MARSSIM Survey </div> </div>		3	North Wall	1.1	10.0	11.1	2.1	137.0	139.1									
		4	North Wall	0.0	0.0	0.0	1.7	220.0	221.7									
		5	South Wall	0.0	5.0	5.0	0.0	226.0	226.0									
		6	South Wall	0.0	20.0	20.0	0.5	112.0	112.5									
		7	East wall	0.0	0.0	0.0	0.0	449.0	449.0									
		8	East wall	0.0	0.0	0.0	0.0	497.0	497.0									
		<div style="display: flex; justify-content: space-between;"><div>Contamination</div><div>Radiation</div></div>		9	West Wall	0.0	0.0	0.0	0.0	551.0	551.0							
				10	West Wall	0.0	0.0	0.0	0.0	512.0	512.0							
25% Surface scan completed with an E-600/380AB.		11	Ceiling	1.0	0.0	1.0	0.0	207.0	207.0									
		12	Ceiling	0.0	0.0	0.0	1.7	303.0	304.7									
		13	North Wall	0.0	30.0	30.0	0.0	404.0	404.0									
		14	North Wall	1.2	10.0	11.2	2.5	150.0	152.5				N					
		15	South Wall	0.0	30.0	30.0	0.0	296.0	296.0									
		16	South Wall	0.0	10.0	10.0	3.2	182.0	185.2									
		17	East wall	1.1	0.0	1.1	0.0	0.0	0.0									
		18	East wall	1.3	0.0	1.3	1.5	35.0	36.5									
<div style="display: flex; justify-content: space-between;"> <div>Instrument</div> <div>P/N #</div> <div>Cal Due</div> <div>Bkgd</div> <div>MDA</div> <div>units</div> </div>		19	West Wall	0.0	0.0	0.0	0.0	334.0	334.0									
		20	West Wall	0.0	0.0	0.0	1.5	376.0	377.5									
<div style="display: flex; justify-content: space-between;"> <div>E600</div> <div>12457</div> <div>5/5/2016</div> <div>46.8</div> <div>86</div> <div>α dpm</div> </div>		21																
		22																
<div style="display: flex; justify-content: space-between;"> <div>SHP380</div> <div>13799</div> <div>10/2/2016</div> <div>1095</div> <div>359</div> <div>βdpm</div> </div>		23																
		24																
<div style="display: flex; justify-content: space-between;"> <div>E600</div> <div>12457</div> <div>5/5/2016</div> <div>20</div> <div>62</div> <div>α dpm</div> </div>		25																
		26																
<div style="display: flex; justify-content: space-between;"> <div>SHP380</div> <div>13799</div> <div>10/2/2016</div> <div>1296</div> <div>389</div> <div>βdpm</div> </div>		27																
		28																
<div style="display: flex; justify-content: space-between;"> <div>N</div> <div>A</div> </div>		29																
		30																
See attached data sheets.		31																
		32																
<div style="display: flex; justify-content: space-between;"> <div>RCT Signature: G. Winder</div> </div>		33																
		34																
<div style="display: flex; justify-content: space-between;"> <div>Supervisor: L. Priester / B. Mclean</div> </div>		35																
		36																

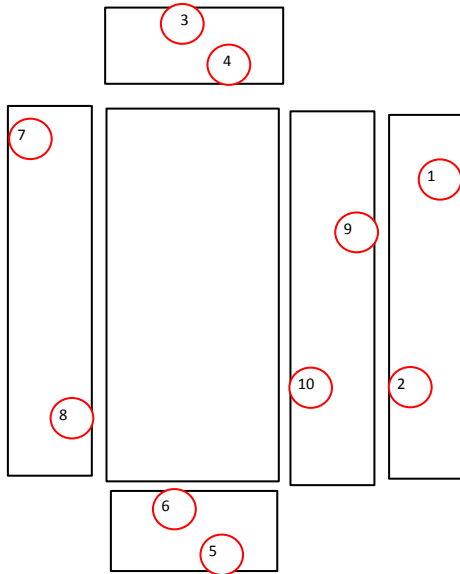
See attached for additional survey information

Contamination/Radiation Survey Report 2015 (Continuation)

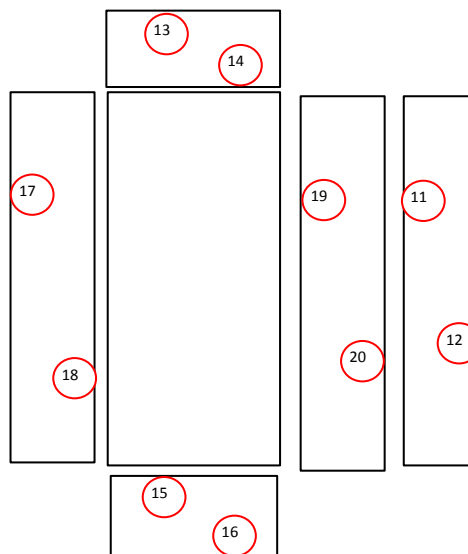
Survey Number: TA21-2015-00355	Date/Time: 12-17-2015 / 09:00	Comments: TA-21 Sewage Treatment Plant North/South Sumps
Location: TA-21-STP North / South Sumps	Surveyor: G. Winder	

TA-21 STP North & South sump

North Sump



South Sump



HPAL ANALYSIS REPORT

FILE: 15111001

Sample Description

Login Date: 11/10/2015 09:59
Sample Type: Other
Location: TA-21/227
Room: NA
Priority: Routine

Analysis Information

Instrument: BEGe-Low
Analysis: Isotopic
Date: 11/17/2015 11:22
Analyst: 235960 *elt*

Contact Information

Name: PATRICIA LOZANO
Phone: 505-500-7373
Page/Cell: -
e-mail: -

Sample ID or Description: Sample #1

Login Comments: SAVE SAMPLES

Isotope Name	Activity (pCi/g)	2*sigma (pCi/g)	MDA (pCi/g)
Am-241	NDA	NDA	2.37E-01
U-235	NDA	NDA	3.15E-01
U-238	NDA	NDA	7.43E+00

HPAL ANALYSIS REPORT

FILE: 15111001

Sample Description

Login Date: 11/10/2015 09:59
Sample Type: Other
Location: TA-21/227
Room: NA
Priority: Routine

Analysis Information

Instrument: LOAX-2
Analysis: Isotopic
Date: 11/17/2015 11:24
Analyst: 235960 *eh*

Contact Information

Name: PATRICIA LOZANO
Phone: 505-500-7373
Page/Cell: -
e-mail: -

Sample ID or Description: Sample 2a

Login Comments: SAVE SAMPLES

Isotope Name	Activity (pCi/g)	2*sigma (pCi/g)	MDA (pCi/g)
Am-241	NDA	NDA	5.73E-01
U-235	NDA	NDA	5.22E-01
U-238	NDA	NDA	4.49E+01

HPAL ANALYSIS REPORT

FILE: 15111001

Sample Description

Login Date: 11/10/2015 09:59
 Sample Type: Other
 Location: TA-21/227
 Room: NA
 Priority: Routine

Analysis Information

Instrument: LOAX-2
 Analysis: Isotopic
 Date: 11/17/2015 11:25
 Analyst: 235960 *EH*

Contact Information

Name: PATRICIA LOZANO
 Phone: 505-500-7373
 Page/Cell: -
 e-mail: -

Sample ID or Description: Sample 2b

Login Comments: SAVE SAMPLES

Isotope Name	Activity (pCi/g)	2*sigma (pCi/g)	MDA (pCi/g)
Am-241	NDA	NDA	1.05E+00
U-235	NDA	NDA	9.61E-01
U-238	NDA	NDA	2.89E+01

HPAL ANALYSIS REPORT

FILE: 29164107

Sample Description	Analysis Information	Contact Information
Login Date: 11/03/2015 14:25	Instrument: TA03-TC3	Name: BRYAN BONSER
Sample Type: Liquid	Analysis: Isotopic	Phone: 505-500-2155
Location: TA-21/227	Date: 11/12/2015 14:39	Page/Cell: -
Room: N/A	Analyst: 116870 <i>mm</i>	e-mail: BBONSER@LANL.GOV
Priority: Routine	Sample ID or Description: Sump Water #1	
Analysis Comments: 3 mL aliquot. MDA at 99.8% CL.		

Isotope Name	Activity (uCi/L)	2*sigma (%)	MDA (uCi/L)
Alpha	NDA	NDA	2.10E-03
Beta<25keV	NDA	NDA	7.80E-03
Beta>25keV	NDA	NDA	3.00E-03

HPAL ANALYSIS REPORT

FILE: 29164107

Sample Description	Analysis Information	Contact Information
Login Date: 11/03/2015 14:25	Instrument: TA03-TC3	Name: BRYAN BONSER
Sample Type: Liquid	Analysis: Isotopic	Phone: 505-500-2155
Location: TA-21/227	Date: 11/12/2015 14:40	Page/Cell: -
Room: N/A	Analyst: 116870	e-mail: BBONSER@LANL.GOV
Priority: Routine		
Sample ID or Description: Sump Water #2		
Analysis Comments: 3 mL aliquot. MDA at 99.8% CL.		

Isotope Name	Activity (uCi/L)	2*sigma (%)	MDA (uCi/L)
Alpha	NDA	NDA	2.10E-03
Beta<25keV	NDA	NDA	4.60E-03
Beta>25keV	NDA	NDA	3.00E-03